Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

PRELIMINARY ASSESSMENT OF QUARTZITE NEAR WABUSH LAKE, NEWFOUNDLAND (NEWFOUNDLAND/CANADA MDA)

FINAL REPORT

BY

GOLDER ASSOCIATES

ST. JOHN'S, NF

Work on this project was conducted under the auspices of the Department of Energy, Mines and Resources.

DSS FILE NUMBER: 15SQ.23440-6-9056

DSS CONTRACT NUMBER: 23440-6-9056/01-SQ

EMR SCIENTIFIC AUTHORITY: R.K. Collings

64 pp + figs.

MICROMEDIA

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CONSULTING GEOTECHNICAL AND MINING ENGINEERS

March 15, 1987 861-5064

Department of Energy, Mines & Resources
CANMET, Mineral Sciences Labs
555 Booth Street
Ottawa, Ontario
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ATTENTION: Mr. R.K. Collings, P.Eng.

RE: FINAL REPORT
PRELIMINARY ASSESSMENT OF QUARTZITE
NEAR WABUSH LAKE, NEWFOUNDLAND
(NEWFOUNDLAND/CANADA MDA)

Dear Sir:

Eight copies of the final report on the above project are submitted herewith.

This report completely documents the activities and findings of the field and laboratory phases of this project.

We wish to acknowledge the input and assistance throughout the project provided by you and to record our appreciation. Should any clarification of the contents of this submission be necessary please contact our office.

Yours very truly,

GOLDER ASSOCIATES

Wm. L. White

Wm. L. White, P.Eng.

WLW/ep

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1.0 EXECUTIVE SUMMARY

Quartzite deposits west of Wabush Lake, Labrador were known from surface sampling programs to have a relatively high silica content. To further establish the economic feasibility of two of these deposits a drilling, sampling and laboratory testing program was conducted to provide additional information on the physical limits and chemical composition of two prospects known as 2907 Hill and Fermont Highway. Funding for this project was provided under the Newfoundland/ Canada Mineral Development Agreement.

Golder Associates acted as prime consultants and project managers with drilling services subcontracted to Longyear Canada, Inc. and TMG Rock Contractors Ltd. Chemical analyses of selected samples were conducted by Chemex Labs Ltd. This factual report presents details of the field and laboratory investigations conducted, including results.

The two deposits investigated have contrasting physical characteristics. The 2907 Hill Prospect comprises hard quartzite rock while the Fermont Highway deposit is very friable with a sand-like texture when disturbed.

The field investigation was carried out between 2 September and 9 October 1986 and comprised six drill holes at each site. At the 2907 Hill deposit 281.9 m of conventional rock core was recovered from diamond drill holes varying in depth between 23.5 and 120.4 m using conventional rotary coring techniques. An alternate method was necessary to recover samples of the friable material at the Fermont Highway location, where samples were recovered using an air percussion drilling/sampling system. A total of 150.9 m of sample was recovered at this site with individual drill hole depths varying between 10 and 42.7 m.

Selective sampling was conducted at both locations for chemical analysis, with samples typically representing each 3 m section of drill hole. A total of 157 samples were analysed using high precision laboratory procedures for silica content, nine major elements and loss on ignition.

With current information reserves of at least 20 million tonnes of quartzite with an average silica content grading in excess of 99.3 percent are contained in the 2907 hill deposit. Concentrations of alumina and iron average less than 0.20 and 0.24 percent respectively for the samples tested. Total reserves in this deposit are limited by an amphibolite/banded gneiss sequence present at less than 90 m below the summit.

Reserves in the Fermont Highway deposit are estimated to be at least 4 million tonnes of quartzite/silica sand which graded an average of 98.7 percent silica for the samples tested. Average concentrations of alumina and iron are 0.60 and 0.48 percent respectively, with traces of other elements also present. Development costs for this deposit will be relatively low due to its physical characteristics and proximity to the highway.

Additional information regarding the physical limits of these deposits and variation in chemical composition will be necessary before reserves and mineral quality can be fully assessed.

1.0 RESUME DES OPERATIONS

Des programmes d'échantillonnage de surface ont montré que les dépots de quartzite situés à l'ouest du lac Wabush au Labrador avaient une teneur en silice relativement élevée. Afin de mieux démontrer la rentabilité économique de deux de ces dépôts, un programme de forage et d'échantillonnage a été entrepris pour recueillir des données supplémentaires sur les limites géographiques et la composition chimique de deux zones connues sous le nom de Butte 2907 et Route Fermont. Le financement de ce projet a été assuré par l'Entente Terre-Neuve/Canada pour le développement des ressources minérales.

Golder Associates agissait comme consultant principal et directeur de projet, les travaux de forage étant assurés sous forme de sous-contrat par Longyear Canada Inc. et TGM Rock Contractors Ltd. Les analyses chimiques sur les échantillons choisis ont été effectuées par Chemex Labs Ltd. Le présent rapport présente les détails pratiques des reconnaissances sur place et des essais de laboratoire, avec leurs résultats.

Les deux dépôts considérés ont des caractéristiques physiques très différentes. La zone de la Butte 2907 est formée d'une roche quartzitique dure alors que le dépôt de la Route Fermont est très friable avec une texture proche de celle d'un sable lorsque le matériau est remanié.

La reconnaissance sur place a été effectuée entre le 2 Septembre et le 9 Octobre 1986 avec six trous de forage sur chaque site. Au dépôt de la Butte 2907, 281,9 m d'échantillons de roche ont été récupérés par forage au diamant à des profondeurs variant de 23,5 à 120,4 m, avec des techniques de forage en rotation conventionnelles. Il a fallu employer une méthode différente pour échantillonner le matériau friable au site de la Route Fermont et un système

forage/échantillonnage à percussion pneumatique a été utilisé. En tout, 150,9 m d'échantillons ont été récupérés sur ce site dans des trous de forage dont la profondeur variait de 10 à 42,7 m.

Un échantillonnage sélectif destiné aux analyses chimiques a été effectué aux deux sites, avec des specimens représentatifs de chaque 3 m de longueur de forage. Un total de 157 échantillons a été analysé en suivant des procédures de laboratoire de haute précision pour déterminer la teneur en silice, neufs éléments principaux et la perte de masse à la combustion.

Selon les informations actuelles le site de la Butte 2907 contiendrait des réserves d'au moins 20 millions de tonnes de quartzite avec une teneur moyenne en matériau siliceux supérieure à 99.3 pourcent. Les concentrations en alumine et fer sont en moyenne inférieures à 0.20 et 0.24 pourcent respectivement, pour les échantillons considérés. Les réserves totales sur ce site sont limitées par une séquence amphibolite/gneiss en ruban à moins de 90 m sous le sommet.

On estime les réserves du site de la route de Fermont à au moins 4.0 millions de tonnes de sable quartzeux/siliceux, avec une teneur moyenne en silice de 98.7 pourcent. Les concentrations en alumine et en fer sont de 0.60 et 0.48 pourcent respectivement, avec traces d'autres éléments. Le coût de développement de ce site serait relativement bas à cause des caractéristiques physiques du dépôt et de la proximité de la route.

Des données supplémentaires sur les limites géographiques de ces dépôts ainsi que sur les variations de composition chimique sont nécessaires avant que les réserves et la qualité du minerai puissent être pleinement appréciées.

2.0 INTRODUCTION

2.1 Project Background

Deposits of relatively pure quartzite west of Wabush Lake in western Labrador have been known for some time. The Newfoundland Department of Mines & Energy have conducted preliminary investigations of a number of these deposits during the past several years, but these studies have been restricted to surface sampling and mapping. On the basis of this work two sites were identified for additional investigation, comprising drill holes and chemical analyses, to further assess these deposits. This project is being undertaken under the auspices of CANMET (Canada Centre for Mineral and Energy Technology - EMR), with input from the Newfoundland Department of Mines and Energy.

The prospects investigated by this study are identified as:

- 2907 Hill - a prominent hill of massive hard quartzite, with relief of some 100 m and located about 3.5 km NNW of Labrador City.
- Fermont Highway - a deposit of very friable quartzite/silica sand located on the north side of the highway to Fermont, Que., some 2 km west of Labrador City.

The sites are indicated on Figure 1, Site Location Plan, in Appendix A.

Golder Associates has been retained by Supply & Services Canada, on behalf of CANMET, to carry out a preliminary investigation of the two prospective sites. The Terms of Reference for this project were provided with a Request for Proposal to which this firm responded on 4 July 1986. A formal contract for this work was received on 21 August 1986.

Golder Associates has been the prime consultant on this project with diamond drilling services provided by Longyear Canada, Inc. and chemical analyses conducted by Chemex Labs Ltd. as subcontractors. An additional subcontractor, TMG Rock Contractors Ltd., was engaged as a result of necessary modifications to the original field program.

2.2 Study Objectives

The purpose of this project was to obtain information on the two deposits by field sampling and chemical testing to enable a preliminary assessment of the type, purity, and reserves of high quality quartzite/silica sand present. This information will supplement previous sampling conducted by the Newfoundland Department of Mines & Energy. The preliminary assessment of these two deposits will help to establish their potential viability as sources of silica for various industrial uses such as glass sands, refractory brick, and compounds such as silicon carbide and ferrosilicon.

2.3 Scope of Project

This project comprised the planning, organization, management and execution of a drilling and sampling program at the two selected sites, related chemical analyses, and the compilation of a report detailing the procedures, activities, and results of this study. Technical input was provided mainly by the Scientific Authority and Mr. J. Meyer representing the Newfoundland Department of Mines. Golder Associates managed the project and was represented on site by Mr. R.T. Snelgrove who expedited the field program including drilling activities, sample handling and shipment.

The field investigation comprised six diamond drill holes at the 2907 Hill site with a total cored depth of 281.9 m. At the Fermont Highway site sample recovery was impractical using conventional diamond drilling equipment but samples were recovered using an air percussion technique. Six holes were drilled at this location with a total sampled depth of 150.9 m. The field program was carried out between 2 September and 8 October, with laboratory analyses conducted between 3 October 1986 and 18 February 1987.

Laboratory testing comprised a whole rock analysis for nine major elements and silica using high precision laboratory techniques. A total of 157 samples were analysed with 60 of these samples provided from the Fermont Highway site.

Details of the field investigation and laboratory phases of this project, including results, are presented in this factual report. It also contains approximate estimates of the available reserves in these two deposits. This report does not, however, contain detailed descriptions of the geology or mineralogy of the prospects investigated, nor are attempts made to assess the economic feasibility of these deposits.

2.4 Report Organization

The following sections of this report generally describe the activities, procedures and results obtained during this project with detailed factual data presented in Appendices. The existing site conditions are briefly outlined in the following section, with details of the field investigation presented in Section 4. The procedures and scope of the laboratory analyses are outlined in Section 5. The results of the field investigation and chemical analyses for each site are briefly discussed in Section 6, while conclusions from the overall project are outlined in Section 7 of the text. The appendices include graphic presentations related to the field program, summary drill hole logs, tabulated chemical analyses and site photographs.

3.0 SITE CONDITIONS

3.1 Geological Setting

In western Labrador, the northern margin of the Grenville Province, referred to as the Grenville front Tectonic Zone, abuts rocks of the Superior Province to the west and the Churchill Province to the north. This is further represented by the southern portion of the Labrador Trough; a north-south trending belt of predominantly metamorphosed marine sediments. About one billion years ago a series of deformational events known as the Grenvillian Orogeny occurred, resulting in a northerly translation of rocks from within the orogen from which developed a northeast trending of structural elements within the front.

The Knob Lake basin of the Grenville Province is interpreted as being an onlap sequence of rocks, Archean to Helikian in age. Figure 2 depicts the general geology of the area and highlights the Wishart Formation - a littoral facies comprised primarily of quartzite with minor muscovite schist, chert, orthoquartzite and shale. Immediately north and west of the towns of Wabush and Labrador City are prominent white quartzite ridges, one of which is the area of investigation known as 2907 Hill. Approximately four kilometers south-southwest of 2907 Hill is the second area of investigation, a somewhat unique deposit of extremely friable, visibly pure quartzite adjacent to the Fermont Highway.

3.2 Physiography

3.2.1 2907 Hill

This site is a prominent rounded hill approximately four kilometers northwest of the Iron Ore Company of Canada's milling

operations (see Figure 1). It is physically rounded though somewhat elongated northeast-southwest, about 750 m in diameter and slightly greater than 100 m in relief above the surrounding area. By far the gentlest sloping ground access to the summit, marked by a geodetic survey marker, lies towards the southwest (see Photo 1).

Access to this site is gained by a winding, 2.5 km narrow dirt road just north of the Labrador City pumping station. However, this road ends about 2 km south of 2907 Hill. The final one km is a wet and rocky cart-track which cuts through heavily forested, occasionally boggy terrain. Beyond the northern edge of a small lake south of 2907 Hill the vegetation quickly changes to low shrubery, grasses and sparse decidious and coniferous growth generally less than 2.0 m in height. From this point on to the summit there is no established trail.

Near the crest of the hill, outcrops of weathered quartzite become more frequent. Between the outcrops low, shrubs and grasses are common, embedded in peaty soil which is typically less than 1.5 m thick. Visibly, the quartzite outcrops appear white, often iron-stained, very hard, crystalline, and show glacial striations and abundant orthogonal jointing, possibly in response to isostatic rebound (see Photos 2 and 3).

3.2.2 Fermont Highway

The second area investigated is situated immediately north of the Fermont Highway approximately 2.0 km west of the Harrie Lake trailer park access road (see Figure 1). Over the past several years the site has been locally quarried on a small scale and is characterized by a prominent, near-vertical face about 75 m from the highway at the rear of a 100 m wide pit. This outcrop is about 5.0 m in height and some 40 m long (see Photo 4).

From this vertical face the site slopes upwards towards the north about 15-20°, occasionally somewhat steeper. Visually the outcrop is very clean white to clear, coarse grained, extremely friable quartzite.

Vegetation is sparse extending upslope from the highway for about 200 m, consisting of clumps of grass and young alders. Within this clear area, overburden comprises a thin layer of sand. Beyond this area upslope as well as east and west the vegetation becomes moderately thick, consisting of mature alders, birch and spruce trees. Topography to the east and west is fairly gentle. These vegetated areas give rise to an organic horizon overlying a sand/gravel overburden typically 1.5 m thick but up to 5.5 m deep at one test location.

The general topography of the area is shown on Figure 1, while the local topography of the sites investigated is represented on Figures 3 and 5.

4.0 FIELD INVESTIGATION

Planning and mobilization of equipment and personnel to the Labrador City/Wabush area commenced on 25 August 1986, with representatives from Golder Associates and the Newfoundland Department of Mines arriving on the site on 2 September. Drilling equipment arrived by rail on 5 September after shipping delays at Sept Isles. Subsequent to arrival of the first drill crew on 7 September equipment was moved to the Fermont Highway site at the request of the Newfoundland Department of Mines site representative. Several unsuccessful attempts were made at this site to recover samples of the friable quartzite using diamond drilling techniques. The drill rig was subsequently relocated to the 2907 Hill site. A second drill crew arrived on site 11 September, and most of the work at this second location was carried out using two shifts.

The field program was completed on 8 October, and the last personnel demobilized from Labrador City/Wabush on the following day.

Tentative drill hole locations had been established previously on both sites by personnel of the Newfoundland Department of Mines. During this project relative hole locations and surface elevations were established by the field personnel using conventional land surveying techniques.

The final depth of each borehole was generally determined by Mr. J. Meyer in cases where drilling problems were not a factor. Subsampling for chemical analyses was also directed by Mr. Meyer, with selected samples forwarded to Chemex Labs Ltd. for chemical analyses. Sample shipments were made from the site on the 23 and 30 September and on 9 October to the

Chemex Labs depot in Pasadena, Newfoundland. Rock core from drill hole A86-03A was forwarded to CANMET in Ottawa in addition to rejects from all the chemical analysis samples. The remaining samples were forwarded to the Newfoundland Department of Mines Core Storage Facility in Happy Valley/ Goose Bay, Labrador.

Equipment initially provided by Longyear Canada, Inc. included a Longyear Model 38 diamond drill, fully equipped for wireline core drilling and soil sampling. This rig was supported by a John Deere Model 450 tractor/dozer and a full complement of pumps, hoses, drill rods and related tools.

The field investigation activities and procedures are described below separately for each site.

4.1 2907 Hill

The diamond drill rig was moved from the Fermont Highway site to 2907 Hill between 12 and 16 September, with drilling commenced at the initial borehole on this date. Conventional diamond drilling methods were used with core recovered in BQ size (36.5 mm dia.) using wireline equipment. This initial borehole was advanced to a total depth of 120.4 m at the request of Mr. J. Meyer. Drilling continued using the same equipment at the second borehole which was advanced to a depth of 34.5 m at which time a mechanical breakdown occurred. Repair of this problem on site was not practical. A Boyles Model BBS-15 drill rig was subsequently moved to this site from another project on 24 to 26 September, with drilling commenced at a third borehole location on this latter date.

During advancement of the third drill hole equipment became jammed in the hole which had reached a depth of 23.5 m. A second hole was drilled adjacent to the first to a similar depth where the down hole equipment also became jammed, and

it was decided to abandon this location.

A total of six drill holes were eventually completed at this site by 2 October at which time it was considered that sufficient data had been acquired to permit the intended assessment. The total length drilled at this site was 290.0 m with individual hole depths and the number of samples forwarded for chemical analyses as follows:

DRILL HOLE DESIGNATION	TOTAL DEPTH (m)	OVERBURDEN DEPTH (m)	ROCK CORE DEPTH (m)	NUMBER SAMPLES ANALYSED
A86-01	120.4	1.2	119.2	39
A86-02	28.7	1.5	27.2	12
A86-03	23.5	1.2	22.3	8
A86-03A	23.8	1.2	22.6	-
A86-04	47.9	1.2	46.7	21
A86-05	45.7	1.8	43.9	17

The sample interval selected for chemical testing was typically a 3 m coring run except where visible changes were noted in the core colour or mineralogy which dictated a reduced interval.

Drill hole locations are indicated on Figure 3 with Sections included on Figure 4 in Appendix A. A general description of the findings in each drill hole is presented on a Drill Hole Log in Appendix B, which also includes sample intervals.

In addition to the mechanical breakdown, drilling productivity at this site was slowed by the cold, windy weather which prevailed and caused difficulty maintaining the 1.2 km water line.

Equipment was removed from this location on 3 and 4 October, with personnel and equipment demobilized from Labrador City/ Wabush beginning 5 October.

4.2 Fermont Highway

Equipment was moved to this site and set up on 8/9 September and drilling commenced on 10 September. In view of the known friable nature of this deposit initial sampling was attempted using conventional geotechnical sampling methods utilizing a 51 mm OD split barrel sampler driven under impact energy. However meaningful sampler penetration could not be achieved in the formation after several attempts. Conventional rotary core drilling was then attempted using standard BQ-size wire-line equipment. Despite numerous coring runs using varying combinations of rotation speed and penetration rate it was impossible to recover any of the extremely friable quartzite/ silica sand in the core barrel. In the expectation that the formation may have become more competent with depth successive core runs were made to a maximum depth of 29.6 m but no core samples were recovered. Samples of the drill cuttings were recovered in the wash return using this procedure, but such samples were contaminated and deemed unsuitable to meet the sampling objectives of this investigation.

After some discussion among the site personnel, the drilling contractor, the Scientific Authority and Golder Associates Project Manager it was decided to attempt a second coring operation at this location using specialized coring equipment which would minimize disturbance of the material to be sampled. In view of the delay in obtaining this equipment the diamond drill rig was moved to the 2907 Hill site beginning on 12 September.

The specialized drilling equipment arrived in Labrador City/ Wabush on 19 September, and a second drill rig mounted on a muskeg carrier was moved to the Fermont Highway site from another project. Drilling commenced on 21 September with a Boyles Model BBS-15 drill using an NQ-Size, triple tube core

barrel with a face discharge bit to maximize the potential for core recovery. After several core runs and a total penetration of 5 m no core was recovered using this specialized equipment. After additional discussion with the Scientific Authority and the drilling subcontractor it was decided that further attempts using this equipment could not be justified and it was removed from the site beginning 21 September.

When the initial difficulties recovering samples with conventional rotary coring techniques were encountered alternate methods of sample recovery at this location were investigated. It was determined that a specially-modified air track drill would probably enable satisfactory samples to be obtained at the Fermont Highway location, particularly at shallow depths. After discussions with the client and the Scientific Authority it was agreed that a second drilling subcontract agreement should be entered into with TMG Rock Contractors Ltd. to provide the modified air track equipment and operating personnel. This equipment was moved to the site on 22 September but required considerable site preparation and moving support to gain access to the preselected drilling locations.

This equipment comprised a conventional, track-mounted air percussion drill with a large volume compressor using a 70 mm bit. A special housing was fitted at the ground surface to recover the air-lifted material as it reached the top of the hole. It was frequently necessary to install a length of 'casing' at the top of the drill hole to minimize caving of the overburden or loose upper formation (see Photos 5 and 6).

To test this equipment in the friable quartzite a 9.9 m test hole was initially drilled from the floor of the pit about 50 m from the highway. Samples were obtained from this location for chemical analyses to supplement coverage from the main program.

The second drill hole using the air track was advanced to a total depth of 21.3 m with moderate difficulty although satisfactory samples of silica sand were recovered. A total depth of 162.2 m was eventually drilled at this site distributed among six holes as follows:

DRILL HOLE DESIGNATION	TOTAL DEPTH (m)	OVERBURDEN DEPTH (m)	SAMPLE DEPTH (m)	NUMBER SAMPLES ANALYSED
B86FHPB	9.9	-	9.9	3
B86FH01	21.3	-	21.3	9
B86FH02	42.7	1.5	41.2	16
B86FH03	33.5	4.3	29.2	12
B86FH04	21.3	5.5	15.8	8
B86FH05	33.5	-	33.5	12

The hole locations are indicated on the appended Figure 5 of Appendix A, with Sections through the drill holes illustrated on Figure 6.

A sample was recovered from every 3 m section drilled from this site and retained for future subsampling and storage. Careful control of the depth interval actually sampled was maintained by advancing the drill bit in 3 m stages. Samples of dust were also recovered from these holes and were collected and tested separately from the sand fraction.

The findings at each drill hole are generally described on the individual Drill Hole Logs in Appendix B, which also identify the sample intervals selected.

It was decided by the parties concerned to terminate drilling on this site on 26 September and the drill rig and related equipment were removed on this date.

5.0 LABORATORY ANALYSES

Subsamples were shipped from the site to Chemex Labs Ltd. depot at Pasadena, Newfoundland where primary sample preparation was carried out. The initially-prepared samples were then forwarded to the North Vancouver laboratory of Chemex Labs Ltd. Preparation of these samples for chemical testing included: drying, crushing and ring pulverizing using zirconium rings to minus 140 mesh size.

The samples were subjected to a whole rock analysis for the following major elements (expressed as oxides) and Loss on Ignition:

Fe_2O_3	MnO
MgO	K_2O
Al_2O_3	TiO_2
CaO	P_2O_5

In the analysis the samples were fused with lithium metaborate prior to being dissolved in acids and analysed by ICP-AES. In addition the silica content was determined as SiO_2 by a high precision assay using a standard gravimetric procedure with hydrofluoric acid treatment. All analyses were conducted to yeild an accuracy of 0.01 percent.

The sampling procedure used at the Fermont Highway site yielded dust as well as a sand fraction which was collected separately. A separate analysis was carried out on the dust to determine if this portion of the deposit was chemically different from the sand.

The detailed results from this testing program are tabulated in Appendix C for each site. These results are discussed generally in the following Section 6.

6.0 DISCUSSION

This section includes a general discussion contrasting the drilling and sampling techniques required to obtain samples from each of the deposits investigated. In addition a brief summary is provided of the mineralogical/chemical characteristics of each deposit and of the estimated reserves.

6.1 Drilling/Sampling Procedures

This project required the recovery of samples from two mineral deposits with widely varying physical characteristics.

Conventional diamond drill rotary coring in BQ wireline size enabled good quality core samples to be recovered from the competent quartzite at the 2907 Hill location. On the other hand sampling of the very friable quartzite/silica sand at the Fermont Highway deposit was not possible with rotary coring techniques, even when a specialized core barrel and bit designed for friable deposits was used. In addition, samples of this material could not be recovered using conventional geotechnical sampling methods.

Sample recovery in the Fermont Highway deposit was achieved using an uncommon exploration technique using an air percussion type drill with modified fixtures and a large air compressor. Drilling in this deposit however was not totally straightforward and indications of potential problems were observed. Difficulties with this method may occur when overburden depths become significant or when conditions in the borehole encourage caving of material comprising the walls of the uncased hole. In addition, the possibility of contamination of the air-blown samples depends on the effectiveness of the near surface 'casing', and has to be monitored. It is probable, however, that with additional

planning and equipment modification contamination from the surface can be minimized. Another consideration of this sampling technique is the additional support equipment needed to move the drill and air compressor between drill hole locations on most vegetated sites.

6.2 2907 Hill Deposit

6.2.1 Mineralogy

This deposit comprises medium to coarse grained crystalline quartzite. It is predominantly white although the colour ranges through pale yellow, orange, brown to reddish brown and occasionally light grey depending on the impurities present. Fracturing is generally moderate with surfaces frequently coated with limonite, specularite, hematite and geothite. These minerals are also common in vug-like features which vary in frequency throughout the deposit and with the fractures allow seepage. Minor localized biotite and specularite banding is also present.

At depth in this deposit, as evident in Drill Hole A86-01, the concentration of impurities increases significantly (ie. below about 80 m depth or elevation 800 m). The quartzite of the Wishart Formation is underlain by amphibolite and by interbedded crystalline quartzite, quartzbiotite-garnet gneiss of the Sokoman Formation. It is evident that the depth of relatively pure quartzite is limited by this underlying formation of iron-bearing rocks which dips gently towards the south (see Photo 7).

6.2.2 Chemical Analyses

The results of major element analyses on 97 samples selected from the recovered core indicate that the deposit is relatively

pure in terms of silica content expressed as silica dioxide (SiO_2). In the upper 80 m of this deposit the percent SiO_2 reported is generally in excess of 99.6 with the mean value for 90 analyses at 99.3 percent, and with no obvious trend variation with depth. The average value of the impurities is, however, notably higher in samples from Drill Hole A8604 than in the others. The major impurities are generally hematite (expressed as $F3_2O_3$) and/or alumina (expressed as Al_2O_3), with the presence of other components typically being very small except for a few exceptions. Substantial increases in the concentration of hematite were noted in two of the samples obtained below the 80 m depth in Drill Hole A86-01.

6.2.3 Reserve Estimates

On the basis of drill hole data and general topographic information available the estimated reserves of high purity quartzite in the 2907 Hill deposit have been calculated in the order of 20 million tonnes. This very approximate estimate is limited by the drill hole coverage, the fact that only one of the drill holes penetrated the underlying banded gneiss deposit, and the limited topographic data available. Reserve estimates to greater accuracy will require more specific data regarding the physical limits of the deposit.

6.3 Fermont Highway Deposit

6.3.1 Mineralogy

This deposit comprises extremely friable quartzite or silica sand with angular to subangular grains generally ranging from 0.5 to 2.0 mm. This material comprises predominantly clear and occasionally white crystals with trace amounts of dark brown, green and bronze to smokey translucent crystals present. Typically below about 20 m depth the material is very light grey, the grains are typically finer grained, subrounded to subgangular, and about 30 percent have greyish

powder coating. No obvious cementation agent is present. It is interpreted that the change in colour occurs approximately at the static groundwater level in the deposit (see Photo 8).

6.3.2 Chemical Analyses

On the basis of the 54 analyses carried out on sand samples from this site the relatively high degree of purity of this deposit is confirmed with an average of 98.7 percent silica (expressed as SiO_2) and with a minimum value of 98.2 percent for all samples which are not suspect of some surface contamination. In view of the procedure by which these samples were obtained it is our opinion that the results reported may be somewhat conservative in the degree to which they represent the purity of this deposit. The major impurities identified by the analysis are again hematite (expressed as Fe_2O_3) and alumina (expressed as Al_2O_3) with other elements being present in minor concentrations.

Analyses were also conducted on five samples of the dust fraction, collected separately during the drilling procedure from the sand-size material, to determine if there is any significant chemical difference. These represent the finer fractions retained over the major depth of each borehole. The results of the analyses indicate that no meaningful chemical difference is evident for Drill Holes -02, -03, -04 and -05, between the dust fraction and the other samples.

6.3.3 Reserve Estimates

On the basis of the available data this deposit contains at least 4 million tonnes of recoverable, high grade quartzite. This estimate is of course limited by the available data including general topographic information and the limited

coverage of drill holes to date. Refined estimates of reserves will, of course, require more detailed data regarding the physical limits of this deposit, particularly the horizontal extent.

7.0 CONCLUSIONS

This project provided considerable additional information necessary to assess the economic potential of the two deposits investigated. It is evident, however, that more data is necessary to confirm the physical limits of both deposits to permit estimates of the reserves with an acceptable degree of accuracy. In addition, modifications to the sampling technique used at the Fermont Highway deposit may be necessary to obtain high quality samples. With respect to the project Terms of Reference this study well satisfies the overall objectives within the budget limitations imposed.

On the basis of existing information at least 20 million tonnes of relatively high purity, indurated quartzite with an average silica (SiO_2) content in excess of 99.3 percent is present in the 2907 Hill deposit. Concentrations of the most critical impurities in this prospect include an average of less than 0.20 percent alumina (Al_2O_3) and 0.24 percent iron (Fe_2O_3). The lower boundary of this deposit is formed by a banded gneiss sequence at less than 90 m depth below the summit, and the presently-estimated reserves are thus probably somewhat less than originally anticipated. Although the topography at this location is suitable for quarry development substantial infrastructure will be necessary due to its remote location, and blasting and crushing will be required for rock removal and transport.

Information currently available on the Fermont Highway deposit indicates that at least 4 million tonnes of relatively high purity, relatively unconsolidated quartzite is present with an average silica (SiO_2) content of greater than 98.7 percent. Concentrations of the most critical impurities average about 0.60 percent alumina (Al_2O_3) and 0.48 percent

iron (Fe_2O_3). Development of this deposit will be relatively straightforward and at relatively low cost due to its proximity to the highway and its friable character. Minimal infrastructure will be required and extraction will be possible using conventional construction equipment without blasting.

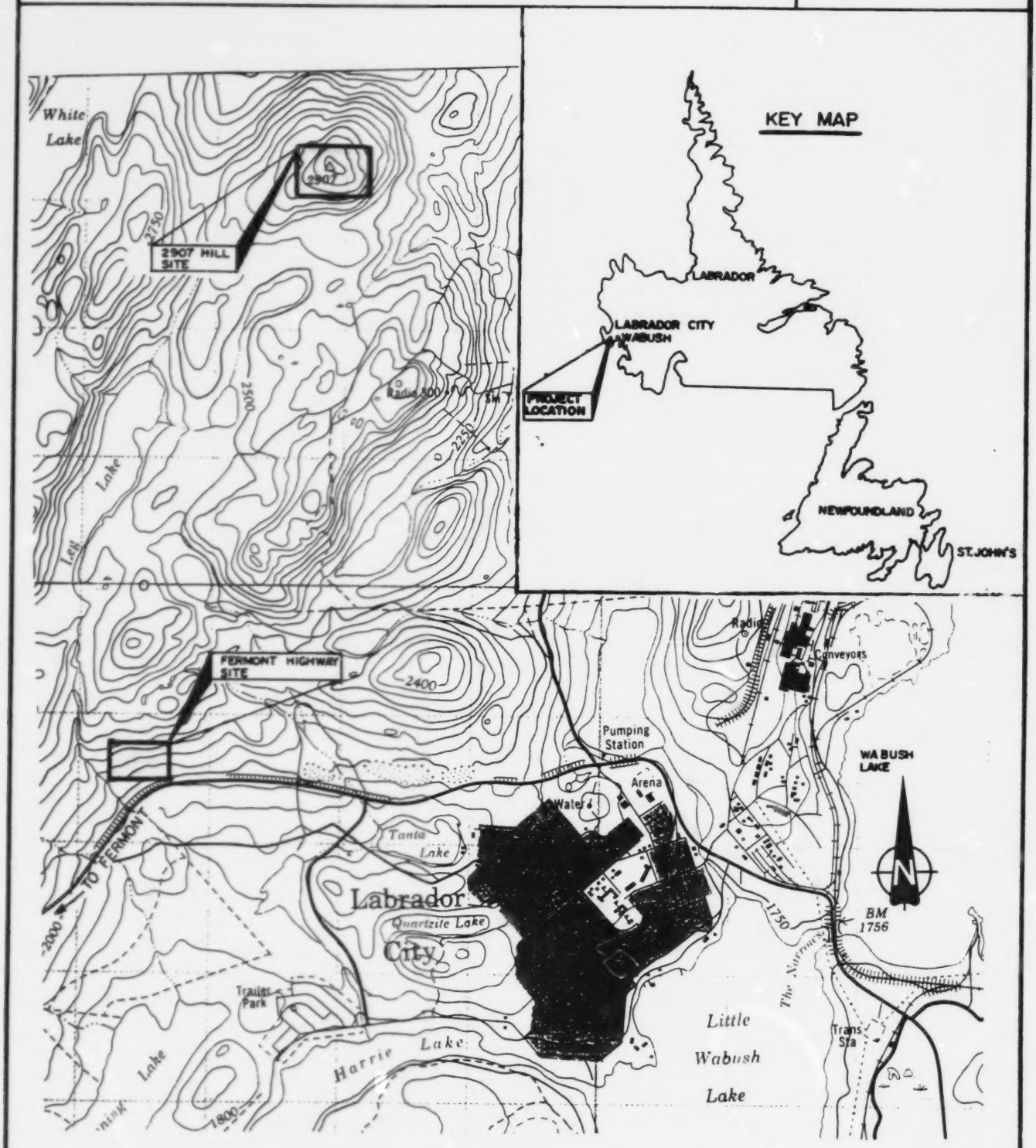
Experience obtained during the field investigation phase of this project indicates that conventional diamond drilling equipment and techniques recover suitable core samples from 2907 Hill deposit. Unconventional sampling techniques are necessary to adequately investigate the very friable Fermont Highway deposit. However, to ensure with a reasonable level of confidence that contamination of samples acquired by such a method does not occur, additional precautions and refinement of the drilling and sampling procedures used on this project should be considered.

APPENDIX A

FIGURES No. 1 TO 6

SITE LOCATION PLAN
PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS
NEAR WABUSH LAKE
NEWFOUNDLAND AND LABRADOR

FIGURE 1



SCALE - 1 : 35,000

SECTION OF NTS SHEET
NO. 23B/15 ENLARGED

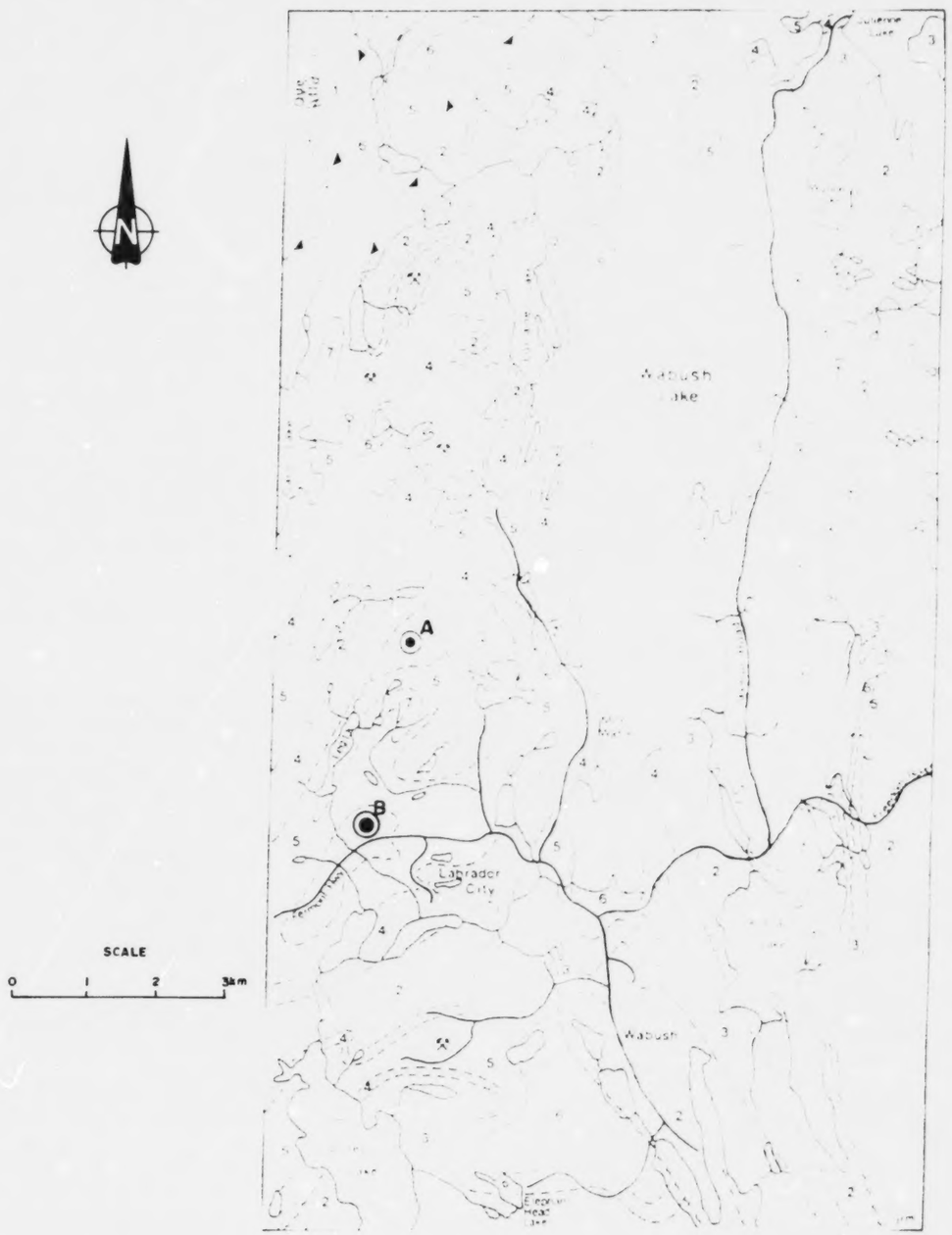
Date NOV., 1986
Project No. 861-5064

Golder Associates

Drawn B.C.
Chkd. W.L.W.

GENERAL GEOLOGY OF THE WABUSH LAKE AREA

FIGURE 2



LEGEND

HELIKIAN

[7] SHABOGAMO INTRUSIVE SUITE

APHEBIAN

KNOB LAKE GROUP

[6] MENIHEK FM.

[5] SOKOMAN FM.

[4] WISHART FM.

[3] DENAULT FM.

[2] ATTIKAMAGEN FM.

ARCHEAN

[1] ASHUANIPI METAMORPHIC COMPLEX

SYMBOLS

GEOLOGICAL CONTACT (approximate; assumed)

FAULT (approximate)

THRUST FAULT (assumed)

PRODUCING IRON MINE

QUARTZITE PROSPECT, 2907 HILL (A)

QUARTZITE PROSPECT, FERMONT HIGHWAY (B)

-NOTE- GEOLOGY AFTER T. RIVERS, 1980

PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS
NEAR WABUSH LAKE
NEWFOUNDLAND AND LABRADOR

Date NOV., 1986

Project 861-5064

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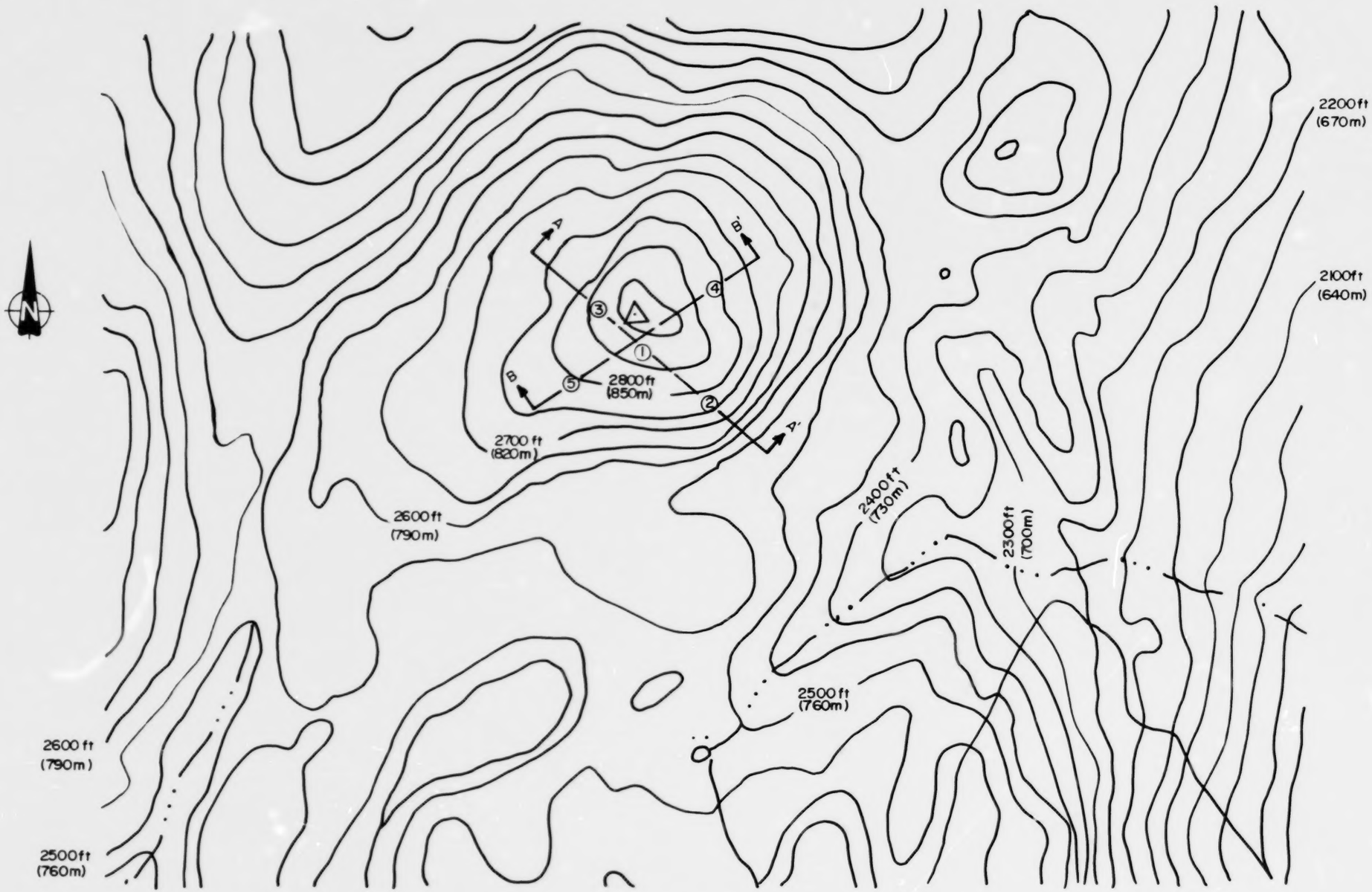
Chkd W.L.W.

BOREHOLE LOCATION PLAN
2907 HILL SIT



LEGEND

- GEODETIC MARKER AT
- CONTOUR INTERVAL 50 ft.

1 - A -86-01
2 - A -86-02
3 - A -86-03/-03A
4 - A -86-04
5 - A -86-05

NOTE : TOPOGRAPHY APPROX
BY ENLARGING 1 : 50,0

PRELIMINARY ASSESSMENT
NEAR WABUSH
NEWFOUNDLAND AN

Date NOV. 1986
Project 861-5064

Golde

BOREHOLE LOCATION PLAN AND TOPOGRAPHY
2907 HILL SITE

FIGURE 3

2200ft
(670m)

2100ft
(640m)

LEGEND

— △ GEODETIC MARKER AT 2907 ft. (886m)

— CONTOUR INTERVAL 50 ft. (15.25m)

① - A -86-01
② - A -86-02
③ - A -86-03/-03A
④ - A -86-04
⑤ - A -86-05

NOTE : TOPOGRAPHY APPROXIMATE AND OBTAINED BY ENLARGING 1 : 50,000 NTS SHEET.

PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS

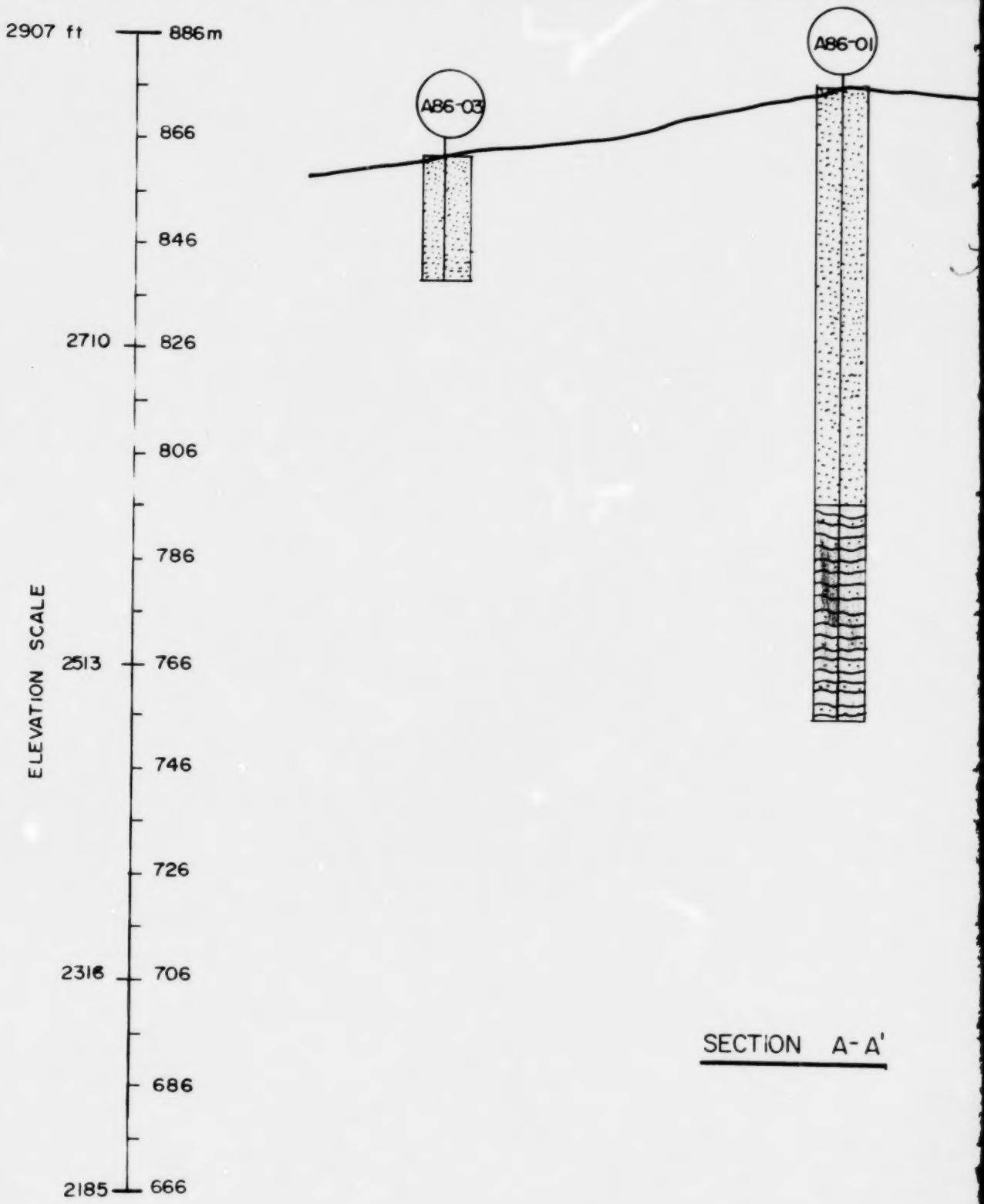
NEAR WABUSH LAKE

NEWFOUNDLAND AND LABRADOR

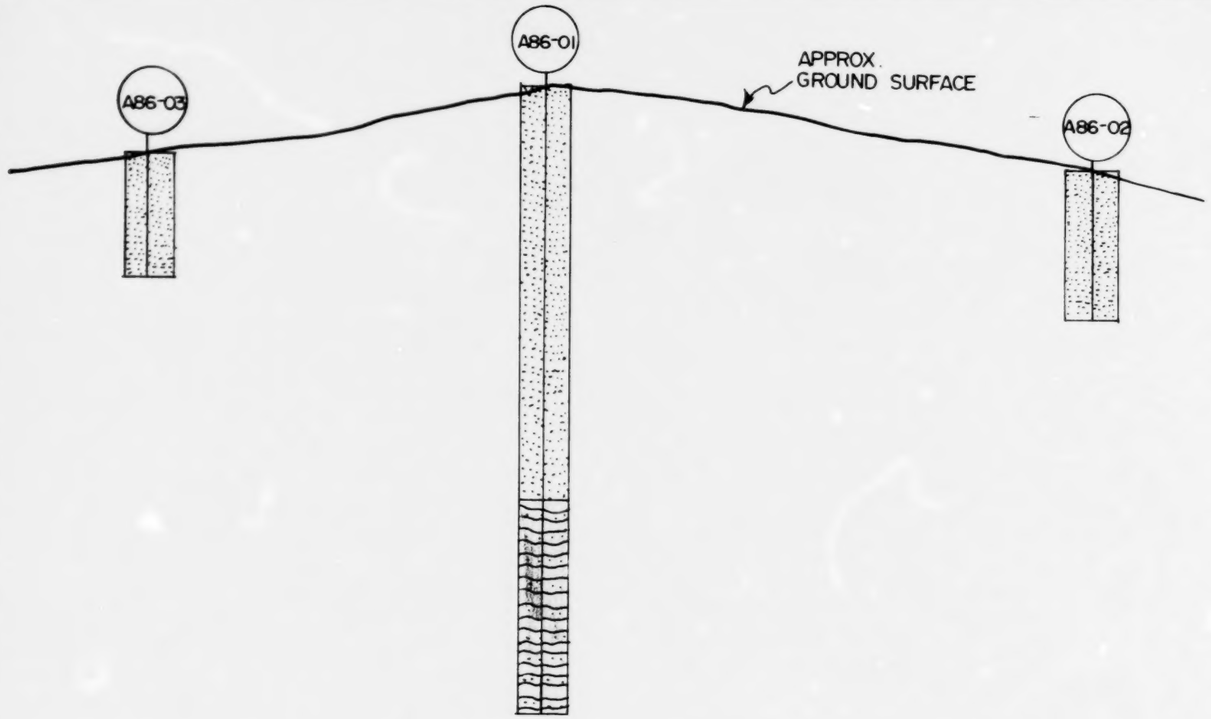
Date NOV. 1986
Project 861-5064

Golder Associates

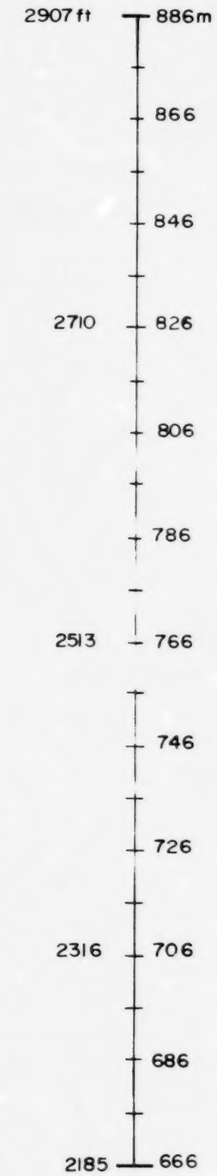
Drawn B.C.
Chkd W.L.W.

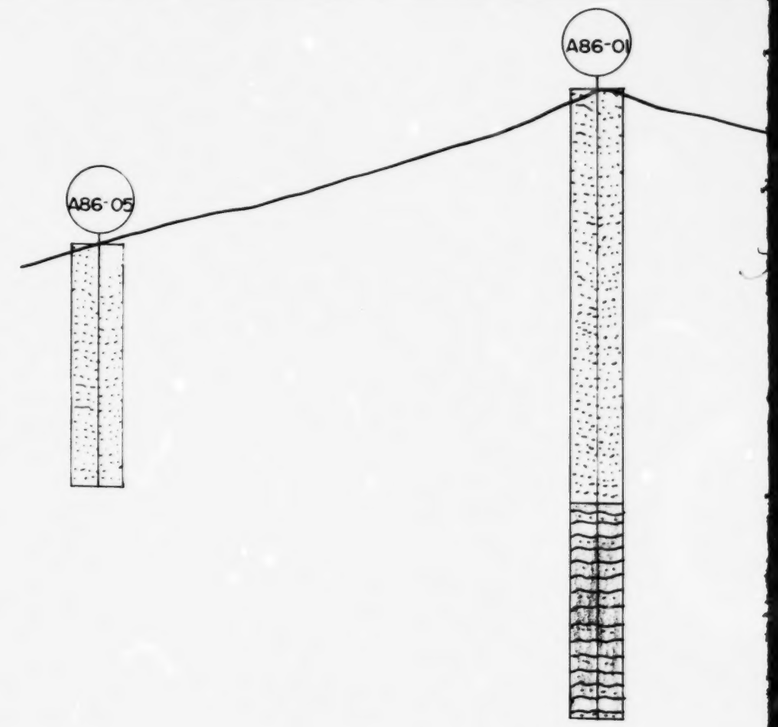

2907 ft
886m
866
846
2710
826
806
786
2513
766
746
726
2316
706
686
2185
666
ELEVATION SCALE
A86-03
A86-01

SECTION A-A'

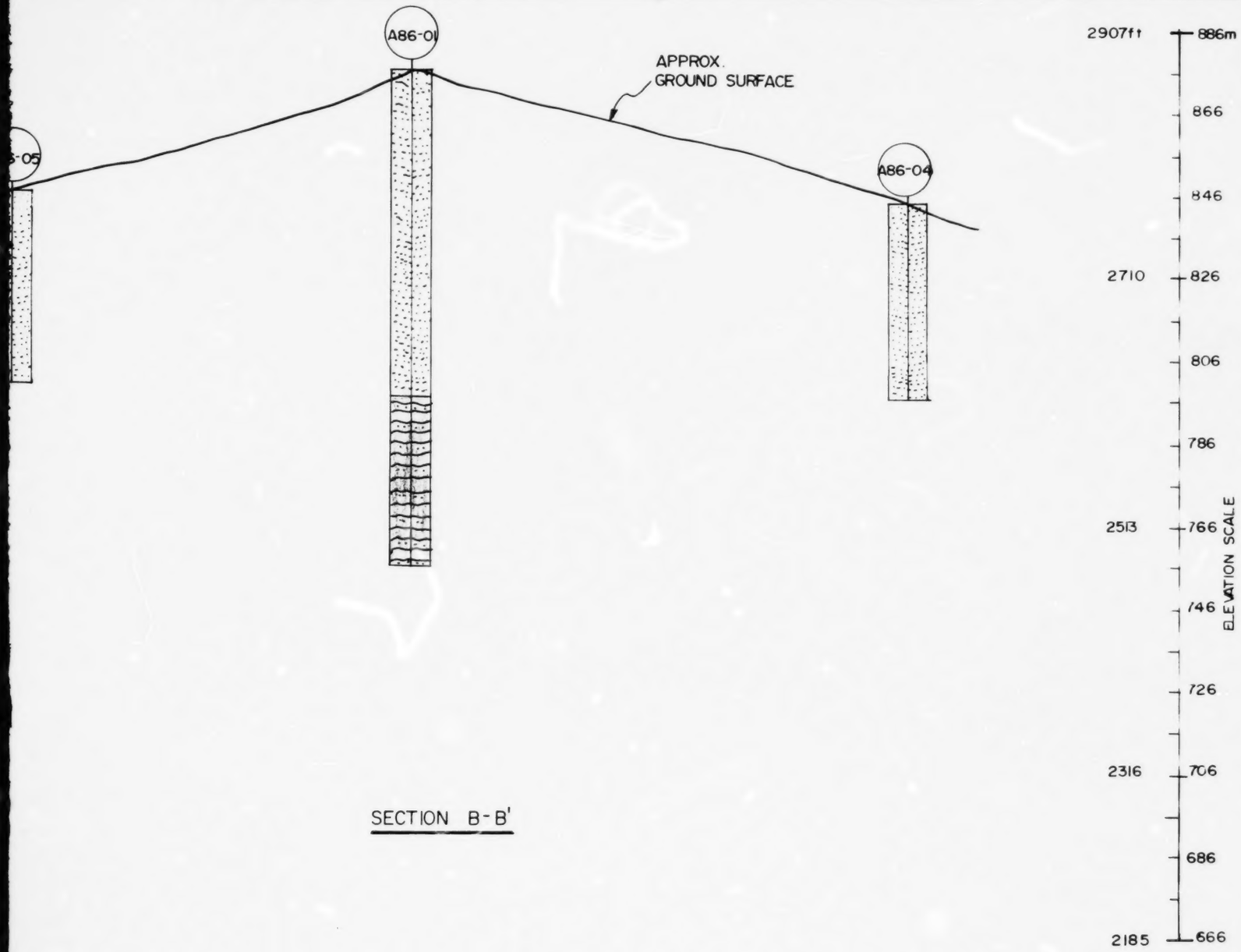


SECTION A-A'





SECTION B-B'



SECTION B-B'

SECTIONS THROUGH DRILL HOLES
2907 HILL SITE

FIGURE 4

LEGEND

QUARTZITE

GNEISS

SCALES

VERTICAL SCALE - 1 : 1000
HORIZONTAL SCALE - 1 : 2000

NOTE FOR SECTION LOCATIONS, REFER TO FIGURE 3

PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS
NEAR WABUSH LAKE
NEWFOUNDLAND AND LABRADOR

Date NOV., 1986
Project 861-5064

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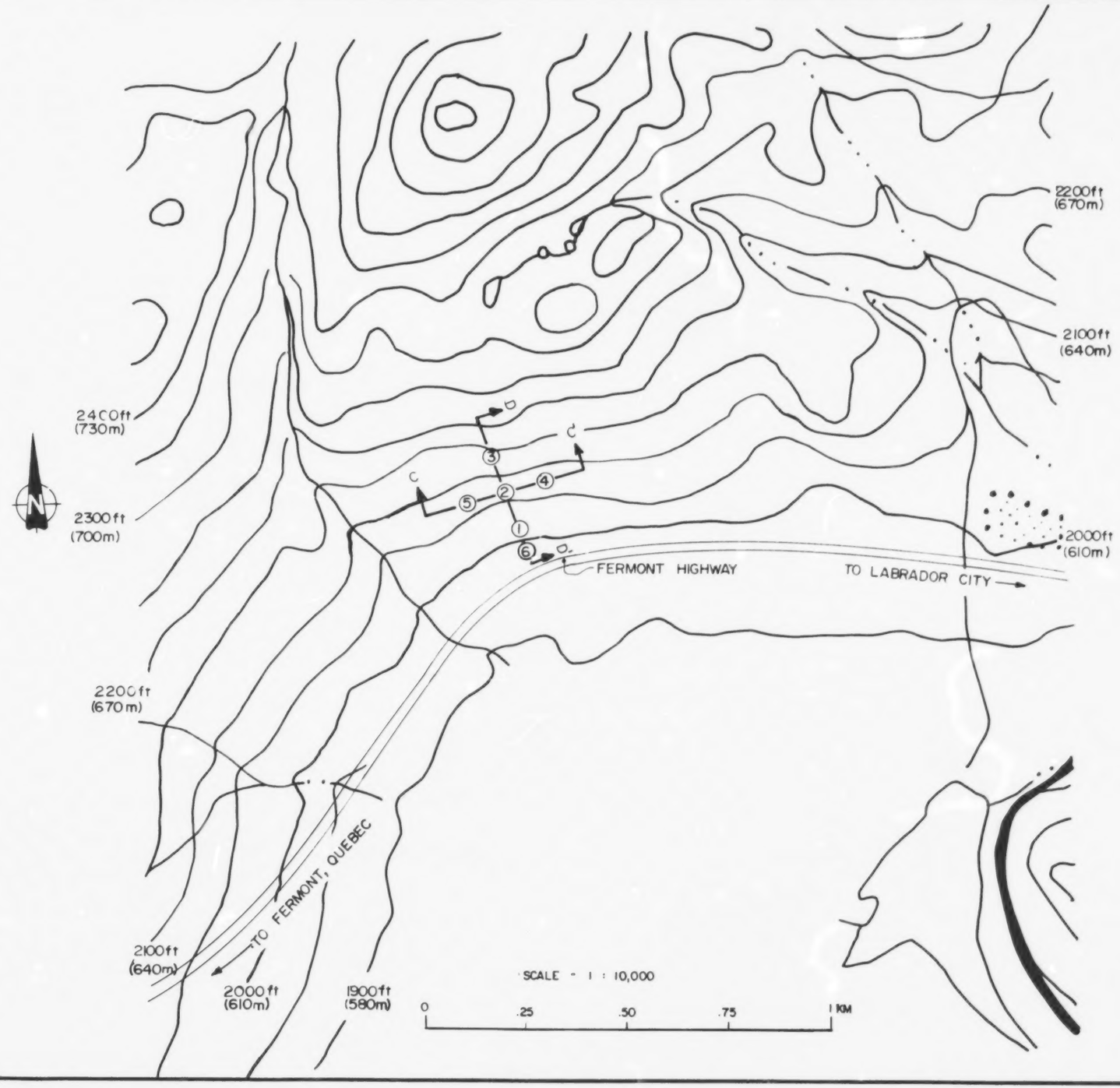
Drawn B.C.
Chkd W.L.W.



BOREHOLE LOCATION
FERMONT

LEGEND

① - B86FH-01
② - B86FH-02
③ - B86FH-03
④ - B86FH-04
⑤ - B86FH-05
⑥ - B86FH-PB

NOTE: TOPOGRAPHY APP
BY ENLARGINING

PRELIMINARY ASSE
NEAR W
NEWFOUNDLA

Date NOV., 1986
Project 861-5064

G

BOREHOLE LOCATION PLAN AND TOPOGRAPHY FERMONT HIGHWAY SITE	FIGURE 5

LEGEND

① - B86FH-01
② - B86FH-02
③ - B86FH-03
④ - B86FH-04
⑤ - B86FH-05
⑥ - B86FH-PB

NOTE: TOPOGRAPHY APPROXIMATE AND OBTAINED BY ENLARGINING 1:50,000 NTS SHEET.

PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS

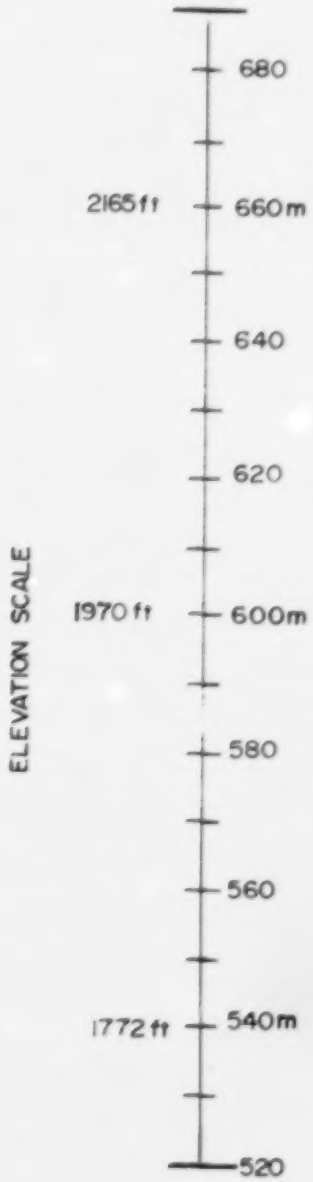
NEAR WABUSH LAKE

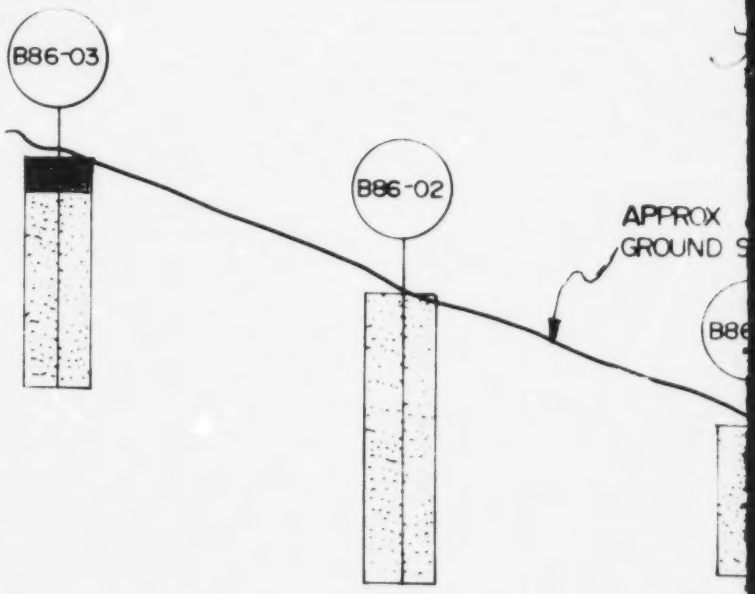
NEWFOUNDLAND AND LABRADOR

Date NOV., 1986
Project 861-5064

Golder Associates

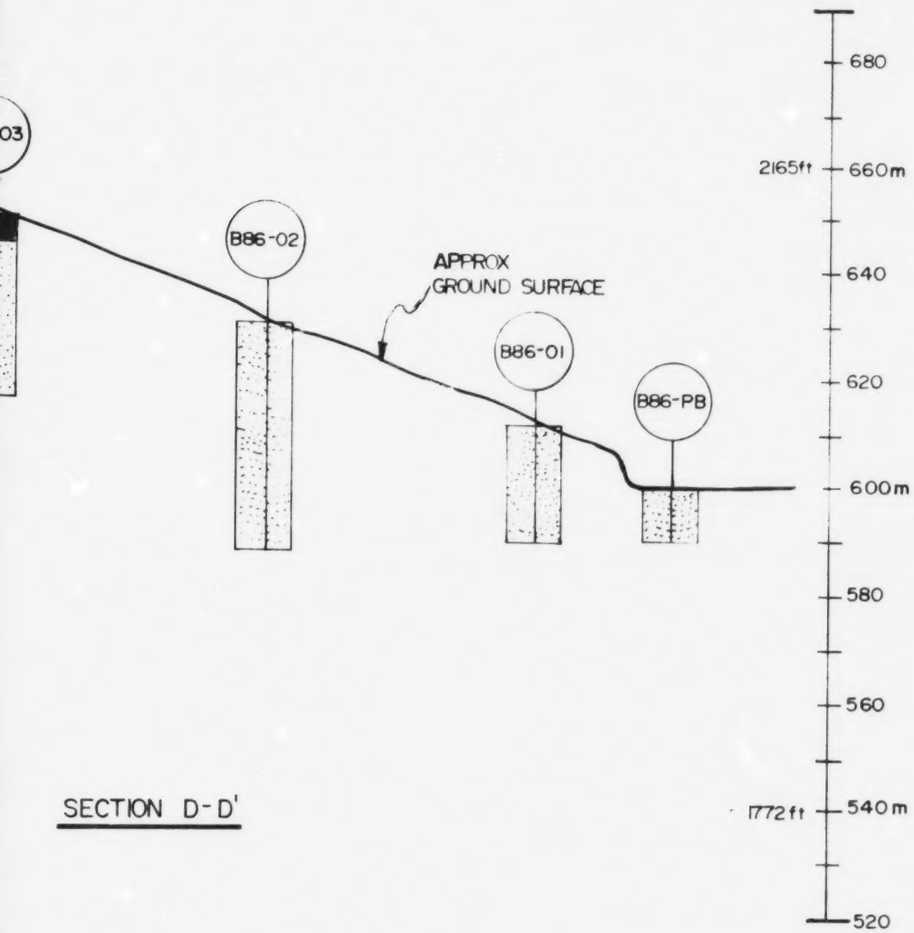
Drawn B.C.
Chkd W.L.W.


ELEVATION SCALE
680
2165 ft
660m
640
620
1970 ft
600m
580
560
1772 ft
540m
520

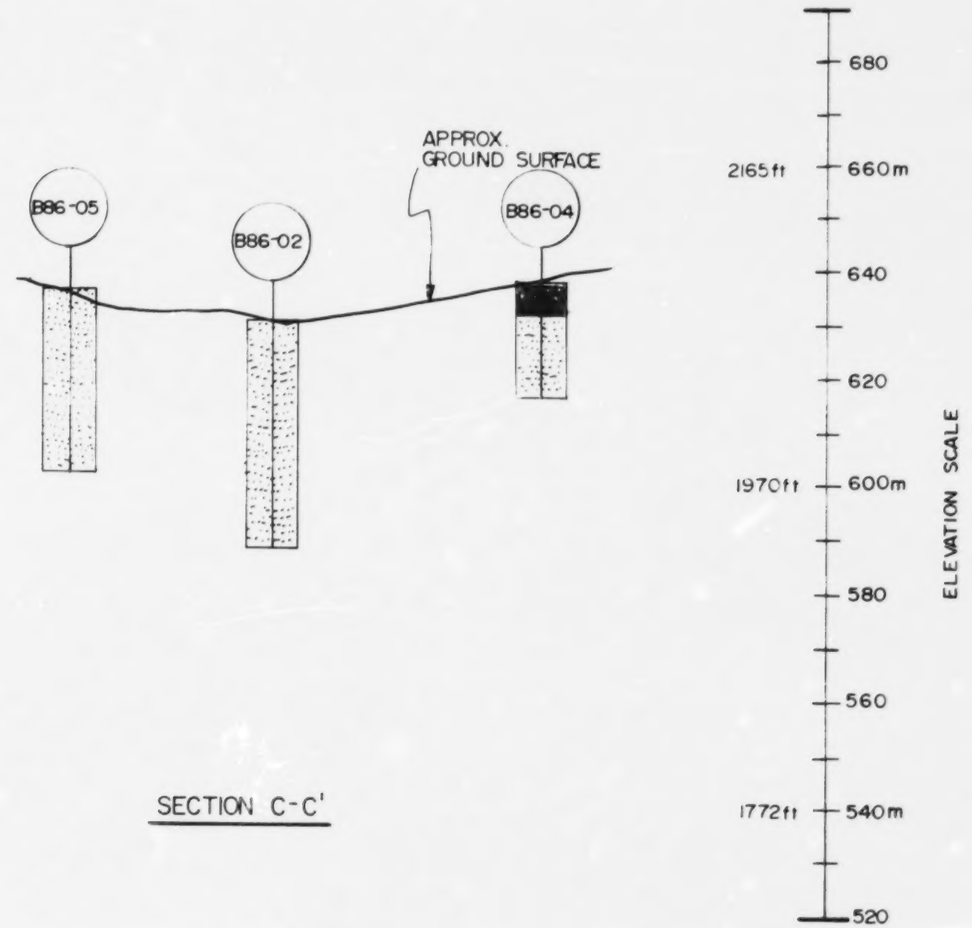

B86-03
B86-02
APPROX
GROUND S
B86

SECTION D-D'

SECTIONS THR
FERMONT



SECTION D-D'



SECTION C-C'

LEGEND

OVERBURDEN

QUARTZITE

SCALES
VERTICAL SCALE -
HORIZONTAL SCALE -

NOTE FOR SECTION LOC

PRELIMINARY ASSES
NEAR W
NEWFOUNDLAN

Date NOV., 1986
Project 861-5064

SECTIONS THROUGH DRILL HOLES
FERMONT HIGHWAY SITE

FIGURE 6

LEGEND

OVERBURDEN

QUARTZITE

ELEVATION SCALE

SCALES
VERTICAL SCALE - 1 : 1000
HORIZONTAL SCALE - 1 : 2000

NOTE FOR SECTION LOCATIONS, REFER TO FIGURE 5

PRELIMINARY ASSESSMENT - QUARTZITE DEPOSITS
NEAR WABUSH LAKE
NEWFOUNDLAND AND LABRADOR

Date NOV., 1986
Project 861-5064

Golder Associates

Drawn B.C.
Chkd W.L.W.

APPENDIX B

DRILL HOLE LOGS (summary)

- 2907 HILL
- FERMONT HIGHWAY

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 120.4m AZIMUTH LOCATION Near Wabush Lake, Nf & Lab. START Sept. 16/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 19/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION
0.0	1.2	Cased overburden
1.2	5.6	Predominantly white, yet often yellow-orange, brown to grey coarse to medium grained equigranular crystalline quartzite. Iron staining is frequent throughout the core with varying amounts of limonite, hematite, geothite and specularite present generally as precipitates in vugular cavities and on 45° to core axis fracture planes. Occasional near-vertical fractures are present as well. Muscovite and biotite are locally present in very minor amounts.
5.6	7.2	
7.2	8.5	
8.5	11.6	
11.6	13.7	
13.7	15.7	
15.7	17.7	
17.7	20.6	
20.6	22.6	
22.6	24.1	
24.1	26.7	
26.7	29.6	
29.6	32.2	
32.2	34.1	
34.1	37.2	
37.2	40.1	
40.1	42.7	
42.7	45.9	
45.9	47.7	
47.7	50.6	
50.6	53.3	
53.3	55.6	
55.6	57.1	
57.1	59.1	
59.1	61.0	
61.0	63.9	
63.9	66.8	
66.8	68.7	
68.7	71.8	
71.8	74.4	
74.4	77.3	
77.3	78.8	
78.8	80.5	

SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)
A8601-01	1.2	3.4	2.2
A8601-02	3.4	5.6	2.2
A8601-03	5.6	8.5	2.9
A8601-04	8.5	11.6	3.1
A8601-05	11.6	13.7	2.1
A8601-06	13.7	15.7	2.0
A8601-07	15.7	17.7	2.0
A8601-08	17.7	20.6	2.9
A8601-09	20.6	22.6	2.0
A8601-10	22.6	24.1	1.5
A8601-11	24.1	26.7	2.6
A8601-12	26.7	29.6	2.9
A8601-13	29.6	32.2	2.6
A8601-14	32.2	34.1	1.9
A8601-15	34.1	37.2	3.1
A8601-16	37.2	40.1	2.9
A8601-17	40.1	42.7	2.6
A8601-18	42.7	45.9	3.2
A8601-19	45.9	47.7	1.8
A8601-20	47.7	50.6	2.9
A8601-21	50.6	53.3	2.7
A8601-22	53.3	55.6	2.3
A8601-23	55.6	57.1	1.5
A8601-24	57.1	59.1	2.0
A8601-25	59.1	61.0	1.9
A8601-26	61.0	63.9	2.9
A8601-27	63.9	66.8	2.9
A8601-28	66.8	68.7	1.9
A8601-29	68.7	71.8	3.1
A8601-30	71.8	74.4	2.6
A8601-31	74.4	77.3	2.9
A8601-32	77.3	78.8	1.5
A8601-33	78.8	80.5	1.7

ANALYSES

HOLE NO.

A8601

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 120.4m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 16/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 19/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
80.5	81.1	Brown-orange earthy porous rock highly broken and containing 30-40% goethite and limonite together with 10% muscovite and amphibolite	A8601-34	80.5	81.1	0.6	
81.1	82.8	Grey-black occasionally white medium to fine grained crystalline quartzite, with an abundance of amphibolite, biotite, limonite, goethite and possibly hornblende and plagioclase.	A8601-35	81.1	82.8	1.7	
82.8	84.4		A8601-36	82.8	84.4	1.6	
84.4	86.9		A8601-37	84.4	86.9	2.5	
86.9	88.7		A8601-38	86.9	88.7	1.8	
88.7	90.5		A8601-39	88.7	90.5	1.8	
90.5	120.4	Interbedded brown-grey crystalline quartzite, quartz-biotite-garnet gneiss and dark green amphibolite. Hornblende may also be present as well as small vugs lined with specularite, goethite and/or limonite. A moderate amount of fracturing has developed and the bedding/foliation of the interbedding material dips 25° to core axis.					

Note: All depths indicated in meters.

HOLE NO.

A8601

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 28.7 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 21/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 21/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.5	Cased Overburden					
1.5	4.3	Generally pale yellow, orange, brown and occasionally	A8602-01	1.5	4.3	2.8	
4.3	6.3	light grey coarse to medium grained crystalline	A8602-02	4.3	6.3	2.0	
6.3	8.5	quartzite with intercrystalline goethite/specularite	A8602-03	6.3	8.5	2.2	
8.5	11.4	banding moderate to steeply dipping with respect to	A8602-04	8.5	11.4	2.9	
11.4	14.0	core axis. Moderate fracturing has developed, and	A8602-05	11.4	14.0	2.6	
14.0	16.8	these are coated with limonite and specularite.	A8602-06	14.0	16.8	2.8	
16.8	20.0	Minor biotite banding occurs locally with garnet	A8602-07	16.8	20.0	3.2	
20.0	23.0	appearing as an accessory mineral.	A8602-08	20.0	23.0	3.0	
23.0	25.8		A8602-09	23.0	25.8	2.8	
25.8	28.7	Note: All depths indicated in meters.	A8602-10	25.8	28.7	2.9	

HOLE NO.

A8602

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 23.8 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 27/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 27/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.2	Cased overburden					
1.2	4.3	White to slightly reddish-brown coarse grained	A8603-01	1.2	4.3	3.1	
4.3	7.3	crystalline quartzite. Minor fractures and	A8603-02	4.3	7.3	3.0	
7.3	10.2	vugs are developed and are infrequently lined	A8603-03	7.3	10.2	2.9	
10.2	13.1	with goethite or limonite. Some intercrystalline	A8603-04	10.2	13.1	2.9	
13.1	16.2	hematite occurs together with localized specularite	A8603-05	13.1	16.2	3.1	
16.2	18.9	banding.	A8603-06	16.2	18.9	2.7	
18.9	21.9		A8603-07	18.9	21.9	3.0	
21.9	23.8		A8603-08	21.9	23.8	1.9	

Note: All depths indicated in meters.

HOLE NO.

A8603

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 23.8 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 27/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 27/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.2	Cased overburden					
1.2	4.3	White to slightly reddish-brown coarse grained	A8603-01	1.2	4.3	3.1	
4.3	7.3	crystalline quartzite. Minor fractures and	A8603-02	4.3	7.3	3.0	
7.3	10.2	vugs are developed and are infrequently lined	A8603-03	7.3	10.2	2.9	
10.2	13.1	with goethite or limonite. Some intercrystalline	A8603-04	10.2	13.1	2.9	
13.1	16.2	hematite occurs together with localized specularite	A8603-05	13.1	16.2	3.1	
16.2	18.9	banding.	A8603-06	16.2	18.9	2.7	
18.9	21.9		A8603-07	18.9	21.9	3.0	
21.9	23.8		A8603-08	21.9	23.8	1.9	
		Note: All depths indicated in meters.					

HOLE NO.

A8603A

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 47.9 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 29/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 30/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.2	Cased overburden					
1.2	4.0	Coarse to medium grained white to light grey crystal-	A8604-01	1.2	4.0	2.8	
4.0	6.9	line quartzite. Grey banding due to intergranular	A8604-02	4.0	6.9	2.9	
6.9	8.5	specularite. Abundant linear vugs lined with dark	A8604-03	6.9	8.5	1.6	
8.5	10.8	brown sugary quartzite ± limonite and goethite.	A8604-04	8.5	10.8	2.3	
10.8	13.3	Moderate fracturing developed 45° to core axis.	A8604-05	10.8	13.3	2.5	
13.3	15.5		A8604-06	13.3	15.5	2.2	
15.5	18.3	Mottled light grey to brown fine grained sugary	A8604-07	15.5	18.3	2.8	
18.3	19.5	quartzite. Again, moderate fracturing and	A8604-08	18.3	19.5	1.2	
19.5	22.3	abundant vugs lined with goethite and limonite.	A8604-09	19.5	22.3	2.8	
22.3	24.8		A8604-10	22.3	24.8	2.5	
24.8	26.2		A8604-11	24.8	26.2	1.4	
26.2	27.4	White to light grey coarse grained crystalline	A8604-12	26.2	27.4	1.2	
27.4	30.5	quartzite with abundant fracturing 45° to core axis.	A8604-13	27.4	30.5	3.1	
30.5	32.3	The fractures are often coated with hematite and/or	A8604-14	30.5	32.3	1.8	
32.3	35.7	goethite.	A8604-15	32.3	35.7	3.4	
35.7	38.3		A8604-16	35.7	38.3	2.6	
38.3	40.8		A8604-17	38.3	40.8	2.5	
40.8	43.0	White to grey occasionally brown fine to medium	A8604-18	40.8	43.0	2.2	
43.0	45.3	grained crystalline quartzite. Moderate fracturing	A8604-19	43.0	45.3	2.3	
45.3	46.3	developed. Sporadic vugs throughout often lined	A8604-20	45.3	46.3	1.0	
46.3	47.9	with limonite and/or goethite. Minor biotite present	A8604-21	46.3	47.9	1.6	
		and concentrated in faint banding.					
		Note: All depths indicated in meters.					

HOLE NO.

A8604

DIAMOND DRILL HOLE RECORD

Site 2907 Hill DEPTH 45.7 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 30/86

LOGGED BY RTS and JRM COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Oct. 2/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.8	Cased overburden					
1.8	4.4	White to grey, coarse to medium grained crystalline quartzite containing sporadic, minor vugs. Steeply dipping fractures coated with goethite and/or limonite, occasionally with muscovite. Red hematite banding developed.	A8605-01	1.8	4.4	2.6	
4.4	6.1		A8605-02	4.4	6.1	1.7	
6.1	7.6		A8605-03	6.1	7.6	1.5	
7.6	8.8		A8605-04	7.6	8.8	1.2	
8.8	11.3		A8605-05	8.8	11.3	2.5	
11.3	14.3		A8605-06	11.3	14.3	3.0	
14.3	17.4		A8605-07	14.3	17.4	3.1	
17.4	20.4		A8605-08	17.4	20.4	3.0	
20.4	23.3		A8605-09	20.4	23.3	2.9	
23.3	25.5		A8605-10	23.3	25.5	2.2	
25.5	27.4		A8605-11	25.5	27.4	1.9	
27.4	30.5	White coarse grained crystalline quartzite with minor intergranular specularite. Moderate fracturing shows no mineral coating. Scattered limonite-filled vugs as well as some hematite staining.	A8605-12	27.4	30.5	3.1	
30.5	33.5		A8605-13	30.5	33.5	3.0	
33.5	36.6		A8605-14	33.5	36.6	3.1	
36.6	39.6		A8605-15	36.6	39.6	3.0	
39.6	42.7	White to reddish-brown coarse to medium grained crystalline quartzite. Red staining in response to intergranular hematite. Minor fracturing, vugs and brown banding.	A8605-16	39.6	42.7	3.1	
42.7	45.7		A8605-17	42.7	45.7	3.0	

Note: All depths indicated in meters.

HOLE NO.

A8605

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 21.3 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 23/86

LOGGED BY RTS COLLAR EL DIP 90 *AT COLLAR *AT *AT FINISH Sept. 23/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	3.1	Predominantly clear, occasionally white, extremely friable quartzite. No observable cementation of the 1.0-2.0 mm subangular to angular grains. Trace amounts of a dark brown to golden translucent mineral were seen petrographically, however a positive identification was not made. No other impurities were observed.	B86FH-01-01	0.0	3.1	3.1	
3.1	6.1		B86FH-01-02	3.1	6.1	3.0	
6.1	9.1		B86FH-01-03	6.1	9.1	3.0	
9.1	12.2		B86FH-01-04	9.1	12.1	3.1	
12.2	15.2		B86FH-01-05	12.2	15.2	3.0	
15.2	18.3		B86FH-01-06	15.2	18.3	3.1	
18.3	19.8		B86FH-01-08	18.3	19.8	1.5	
19.8	21.3	Clear to slightly grey extremely friable quartzite. Average grainsize is 0.5-1.0 mm. The subround to subangular grains have 25-30% of a greyish powder coating, responsible for the overall grey cast on the samples in hand specimen. Trace amounts of the dark translucent mineral were again observed. No visible cementing agent seen, however these samples appeared to contain a greater amount of water.	B86FH-01-09	19.8	21.3	1.5	

Note: All depths indicated in meters.

HOLE NO.

B86FH-01

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 42.7 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab START Sept. 24/86

LOGGED BY RTS COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 25/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	1.5	Cased overburden					
1.5	3.0	Predominantly clear, occasionally white, friable quartzite. No observable cementation of the 1.0 - 2.0 mm subangular to angular grains. Trace amounts of a dark brown to golden translucent mineral were seen petrographically, however a positive identification was not made. No other impurities were observed.	B86FH-02-01	1.5	3.0	1.5	
3.0	6.1		B86FH-02-02	3.0	6.1	3.1	
6.1	9.1		B86FH-02-03	6.1	9.1	3.0	
9.1	12.2		B86FH-02-04	9.1	12.2	3.1	
12.2	15.2		B86FH-02-05	12.2	15.2	3.0	
15.2	18.3		B86FH-02-06	15.2	18.3	3.1	
18.3	21.3		B86FH-02-07	18.3	21.3	3.0	

Notes: All depths indicated in meters.

HOLE NO.

B86FH-02

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 42.7 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 24/86

LOGGED BY RTS COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 25/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
21.3	24.4	Clear to slightly grey extremely friable quartzite. Average grainsize is 0.5 - 1.0 mm. The subround to subangular grains have 25-30% of a greyish powder coating, responsible for the overall grey cast on the samples in hand specimen. Trace amounts of the dark translucent mineral were again observed. No visible cementing agent seen, however these samples appeared to contain a greater amount of water.	B86FH-02-08	21.3	24.4	3.1	
24.4	27.4		B86FH-02-09	24.4	27.4	3.6	
27.4	30.5		B86FH-02-10	27.4	30.5	3.1	
30.5	33.5		B86FH-02-11	30.5	33.5	3.0	
33.5	36.6	Note: All depths indicated in meters.	B86FH-02-12	33.5	36.6	3.1	
36.6	39.6		B86FH-02-13	36.6	39.6	3.6	
39.6	42.7		B86FH-02-14	39.6	42.7	3.1	

HOLE NO.

B86FH-02

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 33.5 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 25/86

LOGGED BY RTS COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 26/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	4.3	Cased overburden.					
4.3	6.1	Predominantly clear, occasionally white, friable quartzite. No observable cementation of the 1.0 - 2.0 mm subangular to angular grains. Trace amounts of a dark brown to golden translucent mineral were seen petrographically, however a positive identification was not made. No other impurities were observed.	B86FH-03-02	4.3	6.1	1.8	
6.1	9.1		B86FH-03-03	6.1	9.1	3.0	
9.1	12.2		B86FH-03-04	9.1	12.2	3.1	
12.2	15.2		B86FH-03-05	12.2	15.2	3.0	
15.2	18.3		B86FH-03-06	15.2	18.3	3.1	
18.3	21.3		B86FH-03-07	18.3	21.3	3.0	
21.3	24.4	Clear to slightly grey extremely friable quartzite. Average grainsize is 0.5 - 1.0 mm. The subround to subangular grains have 25-30% of a greyish powder coating, responsible for the overall grey cast on the samples in hand specimen. Trace amounts of the dark translucent mineral were again observed. No visible cementing agent seen, however these samples appeared to contain a greater amount of water.	B86FH-03-08	21.3	24.4	3.1	
24.4	27.4		B86FH-03-09	24.4	27.4	3.0	
27.4	30.5		B86FH-03-10	27.4	30.5	3.1	
30.5	33.5		B86FH-03-11	30.5	33.5	3.0	

Note: All depths indicated in meters.

HOLE NO.

B86FH-03

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 21.3 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab. START Sept. 25/86

LOGGED BY RTS COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 25/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	5.5	Cased overburden	B86FH-04-01	0.0	5.5	5.5	
5.5	6.1	Predominantly clear, occasionally white, friable quartzite. No observable cementation of the 1.0 - 2.0 mm subangular to angular grains. Trace amounts of a dark brown to golden translucent mineral were seen petrographically, however a positive identification was not made. No other impurities were observed.	B86FH-04-02	5.5	6.1	0.6	
6.1	9.1		B86FH-04-03	6.1	9.1	3.0	
9.1	12.2		B86FH-04-04	9.1	12.2	3.1	
12.2	15.2		B86FH-04-05	12.2	15.2	3.0	
15.2	18.3		B86FH-04-06	15.2	18.3	3.1	
18.3	21.3	Clear to slightly grey extremely friable quartzite. Average grainsize is 0.5 - 1.0 mm. The subround to subangular grains have 25-30% of a greyish powder coating, responsible for the overall grey cast on the samples in hand specimen. Trace amounts of the dark translucent mineral were again observed. No visible cementing agent seen, however these samples appeared to contain a greater amount of water.	B86FH-04-07	18.3	21.3	3.0	

Note: All depths indicated in meters.

HOLE NO.

B86FH-04

DIAMOND DRILL HOLE RECORD

Site: Fermont Highway DEPTH: 33.5 m AZIMUTH: LOCATION: Wabush Lake near NF & Lab. START: Sept. 25/86

LOGGED BY: RTS COLLAR EL: DIP: 90° AT COLLAR: °AT: °AT: FINISH: Sept. 26/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	3.1	Predominantly clear, occasionally white, friable quartzite. No observable cementation of the 1.0 - 2.0 mm subangular to angular grains. Trace amounts of a dark brown to golden translucent mineral were seen petrographically, however a positive identification was not made. No other impurities were observed.	B86FH-05-01	0.0	3.1	3.1	
3.1	6.1		B86FH-05-02	3.1	6.1	3.0	
6.1	9.1		B86FH-05-03	6.1	9.1	3.0	
9.1	12.2	Clear to slightly grey extremely friable quartzite. Average grainsize is 0.5 - 1.0 mm. The subround to subangular grains have 25-30% of a greyish powder coating, responsible for the overall grey cast on the samples in hand specimen. Trace amounts of the dark translucent mineral were again observed. No visible cementing agent seen, however these samples appeared to contain a greater amount of water.	B86FH-05-04	9.1	12.2	3.1	
12.2	15.2		B86FH-05-05	12.2	15.2	3.0	
15.2	18.3		B86FH-05-06	15.2	18.3	3.1	
18.3	21.3		B86FH-05-07	18.3	21.3	3.0	
21.3	24.4		B86FH-05-08	21.3	24.4	3.1	
24.4	27.4		B86FH-05-09	24.4	27.4	3.0	
27.4	30.5		B86FH-05-10	27.4	30.5	3.1	
30.5	33.5		B86FH-05-11	30.5	33.5	3.0	

Note: All depths indicated in meters.

HOLE NO.

B86FH-05

DIAMOND DRILL HOLE RECORD

Site Fermont Highway DEPTH 9.1 m AZIMUTH LOCATION Near Wabush Lake, NF & Lab START Sept. 23/86

LOGGED BY RTS COLLAR EL DIP 90 °AT COLLAR °AT °AT FINISH Sept. 23/86

SECTION FROM (m)	SECTION TO (m)	DESCRIPTION	SAMPLE NUMBER	FROM (m)	TO (m)	WIDTH (m)	ANALYSES
0.0	3.0	Predominantly clear, occasionally white, very friable quartzite. The 1.0 - 2.0 mm subangular to angular grains appeared to have no cementation. No visible impurities were recorded in any of the samples	B86FH-PB-01	0.0	3.0	3.0	
3.0	6.1		B86FH-PB-02	3.0	6.1	3.1	
6.1	9.9		B86FH-PB-03	6.1	9.9	3.0	

HOLE NO.

B86FHPB

APPENDIX C

CHEMICAL ANALYSES

- 2907 HILL
- FERMONT HIGHWAY

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
WESTEND INDUSTRIAL PARK, PASADENA,
NEWFOUNDLAND, CANADA A0L-1K0
PHONE (709) 686-2119

CERTIFICATE OF ANALYSIS A8710929

To : GOLDER ASSOCIATES

716 WATER ST.
ST. JOHN'S, NFLD.
A1E 1C1

Project : DES/QUARTZITE/WABUSH
Comments: CC: JAMIE MEYER

*Page No. :
Tot. Pages:
Date : 18-FEB-87
Invoice # : I-8710929
P.O. # : NONE

SITE 2907 HILL DRILL HOLE: A8601

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
A8601-01	214	232	0.04	0.10	0.03	0.06	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-02	214	232	0.02	0.06	0.02	0.05	0.02	< 0.01	< 0.010	< 0.03	< 0.01	< 0.01
A8601-03	214	232	0.19	0.14	0.03	0.06	0.03	0.02	< 0.010	0.01	< 0.01	< 0.01
A8601-04	214	232	0.03	0.07	0.02	0.05	0.01	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-05	214	232	0.05	0.07	0.03	0.05	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-06	214	232	0.03	0.17	0.02	0.05	0.04	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-07	214	232	0.06	0.09	0.03	0.06	0.04	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-08	214	232	0.03	0.08	0.02	0.06	0.03	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-09	214	232	0.11	0.12	0.04	0.07	0.03	< 0.01	< 0.010	0.02	< 0.01	0.04
A8601-10	214	232	0.95	0.31	0.08	0.06	0.05	0.13	0.030	0.01	< 0.01	0.12
A8601-11	214	232	0.06	0.07	0.02	0.05	0.32	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-12	214	232	0.07	0.11	0.02	0.06	0.03	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-13	214	232	0.04	0.07	0.02	0.09	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-14	214	232	0.50	0.42	0.06	0.05	0.03	0.05	< 0.010	0.01	0.01	0.08
A8601-15	214	232	0.38	0.35	0.07	0.06	0.04	0.04	0.010	0.01	0.02	< 0.01
A8601-16	214	232	0.05	0.13	0.04	0.07	0.02	< 0.01	< 0.010	0.01	< 0.01	0.01
A8601-17	214	232	0.06	0.13	0.03	0.06	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	< 0.01
A8601-18	214	232	0.04	0.08	0.03	0.06	0.02	< 0.01	< 0.010	< 0.01	< 0.01	< 0.01
A8601-19	214	232	0.05	0.10	0.03	0.07	0.02	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-20	214	232	0.26	0.18	0.03	0.05	0.02	0.03	< 0.010	0.01	0.01	< 0.01
A8601-21	214	232	0.04	0.08	0.03	0.07	0.01	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-22	214	232	0.09	0.10	0.03	0.06	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-23	214	232	0.34	0.23	0.04	0.06	0.02	0.05	0.010	0.01	< 0.01	0.04
A8601-24	214	232	0.04	0.07	0.02	0.06	0.02	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-25	214	232	0.10	0.14	0.03	0.06	0.02	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-26	214	232	0.05	0.13	0.03	0.06	0.02	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-27	214	232	0.04	0.08	0.03	0.06	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-28	214	232	0.08	0.11	0.03	0.06	0.03	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-29	214	232	0.20	0.16	0.04	0.07	0.03	0.02	< 0.010	0.02	< 0.01	0.01
A8601-30	214	232	0.12	0.13	0.04	0.07	0.02	< 0.01	< 0.010	0.01	< 0.01	< 0.01
A8601-31	214	232	0.16	0.16	0.05	0.08	0.03	0.02	< 0.010	0.02	< 0.01	< 0.01
A8601-32	214	232	0.09	0.16	0.06	0.10	0.02	< 0.01	< 0.010	0.02	< 0.01	< 0.01
A8601-33	214	232	0.20	0.43	0.06	0.07	0.01	0.02	< 0.010	0.01	0.02	0.05
A8601-34	214	232	1.47	18.09	3.50	0.43	0.04	0.13	0.050	0.22	0.24	0.75
A8601-35	214	232	0.41	4.95	1.17	1.26	0.03	0.05	0.020	0.06	0.09	0.86
A8601-36	214	232	0.34	24.22	4.01	2.20	0.06	0.02	0.020	0.11	0.29	0.98
A8601-37	214	232	0.12	2.10	0.65	0.67	0.03	< 0.01	< 0.010	0.03	0.04	0.72
A8601-38	214	232	0.74	1.20	0.35	0.19	0.05	0.10	0.040	0.02	0.02	0.32
A8601-39	214	232	0.08	0.32	0.06	0.06	0.02	< 0.01	< 0.010	0.02	< 0.01	0.02

Chemex Labs Ltd.
Analytical Chemists • Geochemists • Registered Assayers
WESTEND INDUSTRIAL PARK, PASADENA,
NEWFOUNDLAND, CANADA A0L-1K0
PHONE (709) 686-2119

CERTIFICATE OF ANALYSIS A8622705

To : GOLDER ASSOCIATES

716 WATER ST.
ST. JOHN'S, NFLD.
A1E 1C1

Project : DES/QUARTZITE/WABUSH
Comments: ATTN: GOLDER ASSOCIATES CC: JAMIE MEYER

Date : 18-FEB-87
Invoice # : I-8622705
P.O. # : NONE

SITE: 2907 HILL DRILL HOLE: A8601

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
A8601-01	214	--	99.76
A8601-02	214	--	99.61
A8601-03	214	--	99.29
A8601-04	214	--	99.49
A8601-05	214	--	99.68
A8601-06	214	--	99.80
A8601-07	214	--	99.60
A8601-08	214	--	99.71
A8601-09	214	--	99.62
A8601-10	214	--	98.23
A8601-11	214	--	99.95
A8601-12	214	--	99.61
A8601-13	214	--	99.80
A8601-14	214	--	98.76
A8601-15	214	--	98.99
A8601-16	214	--	99.79
A8601-17	214	--	99.64
A8601-18	214	--	99.78
A8601-19	214	--	99.60
A8601-20	214	--	99.54
A8601-21	214	--	99.69
A8601-22	214	--	99.75
A8601-23	214	--	99.30
A8601-24	214	--	99.80
A8601-25	214	--	99.68
A8601-26	214	--	99.74
A8601-27	214	--	99.59
A8601-28	214	--	99.86
A8601-29	214	--	99.73
A8601-30	214	--	99.66
A8601-31	214	--	99.44
A8601-32	214	--	99.55
A8601-33	214	--	99.13
A8601-34	214	--	76.10
A8601-35	214	--	91.69
A8601-36	214	--	69.77
A8601-37	214	--	96.76
A3601-38	214	--	97.09
A8601-39	214	--	99.47

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
WESTEND INDUSTRIAL PARK, PASADENA,
NEWFOUNDLAND, CANADA A0L-1K0
PHONE (709) 686-2119

CERTIFICATE OF ANALYSIS A8710929

To : GOLDER ASSOCIATES

716 WATER ST.
ST. JOHN'S, NFLD.
A1E 1C1

Project : DES/QUARTZITE/WABUSH
Comments: CC: JAMIE MEYER

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SITE 2907 HILL DRILL HOLE: A8602

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
A8602-01	214	232	0.30	0.24	0.06	0.16	0.04	0.03	< 0.010	< 0.01	< 0.01	0.20
A8602-02	214	232	0.08	0.14	0.04	0.07	0.04	0.01	< 0.010	0.02	< 0.01	0.08
A8602-03	214	232	0.05	0.08	0.04	0.16	0.02	< 0.01	0.020	0.01	< 0.01	0.06
A8602-04	214	232	0.11	0.16	0.04	0.06	0.03	0.01	< 0.010	0.01	< 0.01	0.07
A8602-05	214	232	0.10	0.18	0.03	0.05	0.04	0.01	< 0.010	< 0.01	< 0.01	0.07
A8602-06	214	232	0.05	0.14	0.02	0.05	0.04	< 0.01	< 0.010	< 0.01	< 0.01	0.06
A8602-07	214	232	0.37	0.44	0.06	0.08	0.03	0.05	0.020	0.01	0.02	0.14
A8602-08	214	232	0.07	0.10	0.03	0.05	0.04	< 0.01	< 0.010	0.01	< 0.01	0.10
A8602-09	214	232	0.08	0.60	0.04	0.06	0.04	< 0.01	< 0.010	0.02	0.02	0.16
A8602-10	214	232	0.26	0.30	0.05	0.05	0.04	0.04	0.010	< 0.01	< 0.01	0.15
A8602-11	214	232	0.04	0.09	0.02	0.05	0.03	< 0.01	< 0.010	< 0.01	< 0.01	0.14
A8602-12	214	232	0.04	0.09	0.03	0.08	0.02	0.02	< 0.010	< 0.01	< 0.01	0.14

SITE 2907 HILL DRILL HOLE: A8603

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
A8603-01	214	232	0.04	0.11	0.03	0.09	0.02	0.01	< 0.010	< 0.01	< 0.01	0.15
A8603-02	214	232	0.08	0.14	0.03	0.10	0.04	0.01	< 0.010	< 0.01	< 0.01	0.16
A8603-03	214	232	0.18	0.18	0.03	0.13	0.03	0.03	< 0.010	< 0.01	< 0.01	0.11
A8603-04	214	232	0.07	0.18	0.04	0.23	0.03	< 0.01	< 0.010	< 0.01	< 0.01	0.21
A8603-05	214	232	0.13	0.12	0.04	0.13	0.03	0.02	< 0.010	0.02	< 0.01	0.14
A8603-06	214	232	0.12	0.13	0.04	0.12	0.03	0.01	< 0.010	< 0.01	< 0.01	0.16
A8603-07	214	232	0.11	0.12	0.03	0.06	0.03	0.01	< 0.010	0.01	< 0.01	0.11
A8603-08	214	232	0.08	0.15	0.04	0.08	0.03	< 0.01	< 0.010	0.01	< 0.01	0.13

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CERTIFICATE OF ANALYSIS A8622705

To : GOLDER ASSOCIATES

716 WATER ST.
ST. JOHN'S, NFLD.
A1E 1C1

Project : DES/QUARTZITE/WABUSH
Comments: ATTN: GOLDER ASSOCIATES CC: JAMIE MEYER

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SITE: 2907 HILL DRILL HOLE: A8602

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion									
A8602-01	214	--	99.09									
A8602-02	214	--	99.50									
A8602-03	214	--	99.75									
A8602-04	214	--	99.56									
A8602-05	214	--	99.61									
A8602-06	214	--	99.64									
A8602-07	214	--	98.87									
A8602-08	214	--	99.67									
A8602-09	214	--	99.16									
A8602-10	214	--	99.03									
A8602-11	214	--	99.85									
A8602-12	214	--	99.95									

SITE: 2907 HILL DRILL HOLE: A8603

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion									
A8603-01	214	--	99.69									
A8603-02	214	--	99.64									
A8603-03	214	--	99.33									
A8603-04	214	--	99.42									
A8603-05	214	--	99.55									
A8603-06	214	--	99.53									
A8603-07	214	--	99.43									
A8603-08	214	--	99.39									

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SITE 2907 HILL DRILL HOLE: A8604

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
A8604-01	214	232	0.06	0.12	0.03	0.06	0.03	< 0.01	< 0.010	< 0.01	< 0.01	0.10
A8604-02	214	232	0.14	0.12	0.03	0.06	0.03	0.02	< 0.010	0.01	< 0.01	0.12
A8604-03	214	232	1.29	1.96	0.33	0.05	0.02	0.14	0.040	< 0.01	0.02	0.58
A8604-04	214	232	1.59	0.95	0.21	0.06	0.06	0.24	0.050	< 0.01	0.01	0.41
A8604-05	214	232	1.33	0.20	0.09	0.08	0.06	0.21	0.040	0.01	< 0.01	0.26
A8604-06	214	232	0.99	0.72	0.13	0.06	0.04	0.13	0.020	0.02	0.02	0.36
A8604-07	214	232	0.58	0.50	0.07	0.06	0.03	0.08	0.010	< 0.01	0.02	0.21
A8604-08	214	232	2.04	3.40	0.60	0.16	0.06	0.11	0.050	0.05	0.02	0.75
A8604-09	214	232	0.10	0.17	0.04	0.06	0.03	< 0.01	< 0.010	< 0.01	< 0.01	0.12
A8604-10	214	232	0.06	0.24	0.06	0.09	0.02	< 0.01	< 0.010	< 0.01	0.02	0.11
A8604-11	214	232	0.06	0.16	0.03	0.06	0.02	< 0.01	< 0.010	< 0.01	< 0.01	0.16
A8604-12	214	232	0.16	0.66	0.10	0.11	0.02	0.01	< 0.010	< 0.01	0.03	0.27
A8604-13	214	232	0.37	0.22	0.37	0.59	0.09	0.02	< 0.010	0.02	< 0.01	0.71
A8604-14	214	232	0.08	0.10	0.04	0.07	0.02	< 0.01	< 0.010	0.01	< 0.01	0.12
A8604-15	214	232	0.04	0.07	0.03	0.06	0.02	< 0.01	< 0.010	< 0.01	< 0.01	0.11
A8604-16	214	232	0.13	0.14	0.05	0.07	0.02	0.01	< 0.010	< 0.01	< 0.01	0.07
A8604-17	214	232	0.27	0.34	0.09	0.08	0.02	0.03	< 0.010	0.01	< 0.01	0.15
A8604-18	214	232	0.13	0.25	0.07	0.16	0.03	0.01	< 0.010	0.01	< 0.01	0.15
A8604-19	214	232	0.48	0.80	0.09	0.12	0.03	0.06	0.020	< 0.01	< 0.01	0.12
A8604-20	214	232	0.68	1.21	0.13	0.12	0.04	0.09	0.020	< 0.01	< 0.01	0.22
A8604-21	214	232	0.48	1.00	0.06	0.07	0.04	0.06	0.010	0.01	< 0.01	0.11

SITE 2907 HILL DRILL HOLE: A8605

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
A8605-01	214	232	0.42	0.29	0.06	0.11	0.01	0.05	0.010	0.01	0.01	0.12
A8605-02	214	232	0.17	0.16	0.03	0.06	< 0.01	0.02	< 0.010	< 0.01	0.01	0.03
A8605-03	214	232	0.05	0.06	0.02	0.05	< 0.01	0.01	< 0.010	0.01	< 0.01	0.02
A8605-04	214	232	0.32	0.19	0.06	0.23	< 0.01	0.05	< 0.010	0.02	< 0.01	0.23
A8605-05	214	232	0.03	0.05	0.02	0.04	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.05
A8605-06	214	232	0.07	0.11	0.03	0.05	< 0.01	0.01	< 0.010	< 0.01	< 0.01	0.03
A8605-07	214	232	0.11	0.10	0.03	0.06	< 0.01	0.02	< 0.010	0.01	< 0.01	0.09
A8605-08	214	232	0.05	0.08	0.02	0.06	< 0.01	0.02	< 0.010	0.02	< 0.01	0.12
A8605-09	214	232	0.06	0.23	0.05	0.06	< 0.01	0.05	0.010	0.02	0.01	0.14
A8605-10	214	232	0.14	0.13	0.04	0.08	< 0.01	0.02	< 0.010	0.02	< 0.01	0.02
A8605-11	214	232	0.04	0.08	0.02	0.05	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.04
A8605-12	214	232	0.03	0.06	0.02	0.04	0.01	< 0.01	< 0.010	0.02	< 0.01	0.03
A8605-13	214	232	0.14	0.08	0.03	0.05	< 0.01	0.02	< 0.010	< 0.01	< 0.01	0.08
A8605-14	214	232	0.06	0.06	0.02	0.07	< 0.01	0.01	< 0.010	< 0.01	< 0.01	0.03
A8605-15	214	232	0.04	0.20	0.02	0.05	< 0.01	< 0.01	< 0.010	0.02	< 0.01	0.04
A8605-16	214	232	0.05	0.11	0.03	0.05	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.01
A8605-17	214	232	0.05	0.09	0.02	0.06	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.10

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SITE: 2907 HILL DRILL HOLE: A8604

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
A8604-01	214	--	99.50
A8604-02	214	--	99.41
A8604-03	214	--	94.64
A8604-04	214	--	97.13
A8604-05	214	--	97.84
A8604-06	214	--	97.54
A8604-07	214	--	98.50
A8604-08	214	--	93.25
A8604-09	214	--	99.59
A8604-10	214	--	99.70
A8604-11	214	--	99.46
A8604-12	214	--	98.97
A8604-13	214	--	98.15
A8604-14	214	--	99.64
A8604-15	214	--	99.66
A8604-16	214	--	99.38
A8604-17	214	--	99.12
A8604-18	214	--	99.33
A8604-19	214	--	98.05
A8604-20	214	--	97.48
A8604-21	214	--	98.25

SITE: 2907 HILL DRILL HOLE: A8605

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
A8605-01	214	--	99.25
A8605-02	214	--	99.58
A8605-03	214	--	99.95
A8605-04	214	--	98.99
A8605-05	214	--	99.86
A8605-06	214	--	99.64
A8605-07	214	--	99.74
A8605-08	214	--	99.85
A8605-09	214	--	99.21
A8605-10	214	--	99.54
A8605-11	214	--	99.75
A8605-12	214	--	99.95
A8605-13	214	--	99.65
A8605-14	214	--	99.84
A8605-15	214	--	99.63
A8605-16	214	--	99.65
A8605-17	214	--	99.75

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SITE: FERMONT HIGHWAY DRILL HOLE: B86FH01

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FH01-01	214	232	0.19	0.05	0.03	0.08	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.16
B86FH01-02	214	232	0.34	0.06	0.04	0.09	0.01	0.02	< 0.010	0.01	< 0.01	0.19
B86FH01-03	214	232	0.52	0.07	0.04	0.08	0.01	0.03	0.010	< 0.01	< 0.01	0.31
B86FH01-04	214	232	0.64	0.12	0.04	0.09	< 0.01	0.02	0.010	0.01	< 0.01	0.36
B86FH01-05	214	232	0.79	0.14	0.04	0.07	< 0.01	0.02	0.010	0.01	< 0.01	0.43
B86FH01-06	214	232	0.79	0.13	0.04	0.08	< 0.01	0.01	0.010	0.02	< 0.01	0.45
B86FH01-08	214	232	0.79	0.22	0.04	0.10	< 0.01	0.02	0.010	0.02	< 0.01	0.43
B86FH01-09	214	232	0.91	0.59	0.08	0.13	0.01	0.02	0.020	0.01	< 0.01	0.54

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH02

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FH02-01	214	232	1.31	1.63	0.18	0.25	0.33	0.12	0.040	0.02	0.03	0.54
B86FH02-02	214	232	0.58	0.12	0.04	0.08	0.01	0.01	0.020	0.01	< 0.01	0.34
B86FH02-03	214	232	0.30	0.11	0.05	0.10	< 0.01	0.01	0.010	< 0.01	< 0.01	0.23
B86FH02-04	214	232	0.22	0.05	0.03	0.08	< 0.01	< 0.01	< 0.010	0.02	< 0.01	0.17
B86FH02-05	214	232	0.24	0.04	0.03	0.07	< 0.01	0.01	< 0.010	0.01	< 0.01	0.20
B86FH02-06	214	232	0.23	0.06	0.03	0.06	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.15
B86FH02-07	214	232	0.21	0.08	0.04	0.07	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.22
B86FH02-08	214	232	0.27	0.11	0.03	0.07	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.26
B86FH02-09	214	232	0.22	0.08	0.03	0.06	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.28
B86FH02-10	214	232	0.22	0.09	0.03	0.06	< 0.01	< 0.01	< 0.010	0.02	< 0.01	0.26
B86FH02-11	214	232	0.22	0.11	0.03	0.07	< 0.01	< 0.01	< 0.010	0.02	< 0.01	0.22
B86FH02-12	214	232	0.20	0.15	0.04	0.07	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.24
B86FH02-13	214	232	0.24	0.22	0.04	0.07	< 0.01	0.01	< 0.010	0.02	< 0.01	0.23
B86FH02-14	214	232	0.33	0.34	0.05	0.09	0.02	< 0.01	< 0.010	0.01	< 0.01	0.35
B86FH02-01-09DST	214	232	0.22	0.12	0.04	0.08	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.22
B86FH02-01-14DST	214	232	0.23	0.17	0.04	0.07	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.27

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH03

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FH03-02	214	232	1.19	0.20	0.07	0.07	0.05	0.10	0.030	0.02	< 0.01	0.46
B86FH03-03	214	232	0.68	0.11	0.05	0.08	0.02	0.03	0.020	0.01	< 0.01	0.38
B86FH03-04	214	232	0.75	0.09	0.05	0.08	0.02	0.02	0.020	0.01	< 0.01	0.41
B86FH03-05	214	232	0.68	0.14	0.05	0.08	< 0.01	0.03	0.020	0.02	< 0.01	0.42
B86FH03-06	214	232	0.62	0.11	0.04	0.07	< 0.01	0.04	0.020	0.02	< 0.01	0.34
B86FH03-07	214	232	0.52	0.12	0.04	0.07	< 0.01	0.03	0.020	< 0.01	< 0.01	0.31
B86FH03-08	214	232	0.62	0.17	0.04	0.07	< 0.01	0.02	0.030	0.02	< 0.01	0.36
B86FH03-09	214	232	0.51	0.19	0.03	0.07	< 0.01	0.02	0.020	0.01	< 0.01	0.33
B86FH03-10	214	232	0.51	0.26	0.04	0.08	< 0.01	< 0.01	0.030	0.01	< 0.01	0.39
B86FH03-11	214	232	0.53	0.43	0.04	0.08	< 0.01	0.01	0.030	0.01	< 0.01	0.39
B86FH03-01-11DST	214	232	0.47	0.34	0.06	0.11	< 0.01	0.01	0.020	0.02	< 0.01	0.39

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Project : DES/QUARTZITE/WABUSH
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SITE: FERMONT HIGHWAY DRILL HOLE: B86FH01

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FH01-01	214	--	99.61
B86FH01-02	214	--	99.50
B86FH01-03	214	--	99.22
B86FH01-04	214	--	99.00
B86FH01-05	214	--	99.07
B86FH01-06	214	--	98.90
B86FH01-08	214	--	98.62
B86FH01-09	214	--	98.27

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH02

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FH02-01	214	--	96.08
B86FH02-02	214	--	98.81
B86FH02-03	214	--	99.12
B86FH02-04	214	--	99.35
B86FH02-05	214	--	99.38
B86FH02-06	214	--	99.41
B86FH02-07	214	--	99.48
B86FH02-08	214	--	99.27
B86FH02-09	214	--	99.36
B86FH02-10	214	--	99.23
B86FH02-11	214	--	99.21
B86FH02-12	214	--	99.23
B86FH02-13	214	--	98.97
B86FH02-14	214	--	99.16
B86FH02-01-09DST	214	--	99.33
B86FH02-01-14DST	214	--	99.33

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH03

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FH03-02	214	--	98.04
B86FH03-03	214	--	98.81
B86FH03-04	214	--	98.74
B86FH03-05	214	--	98.73
B86FH03-06	214	--	98.74
B86FH03-07	214	--	99.01
B86FH03-08	214	--	98.68
B86FH03-09	214	--	98.99
B86FH03-10	214	--	98.85
B86FH03-11	214	--	98.66
B86FH03-01-11DST	214	--	98.73

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CERTIFICATE OF ANALYSIS A8710929

To : GOLDER ASSOCIATES

716 WATER ST.
ST. JOHN'S, NFLD.
A1E 1C1

Project : DES/QUARTZITE/WABUSH
Comments: CC: JAMIE MEYER

Date : 18-FEB-87
Invoice # : I-8710929
P.O. # : NONE

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH04

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FH04-01	214	232	7.18	7.98	2.42	3.04	1.87	1.09	0.300	0.11	0.29	4.58
B86FH04-02	214	232	1.43	4.49	0.37	0.30	0.27	0.14	0.070	0.02	0.07	0.65
B86FH04-03	214	232	0.17	1.60	0.04	0.06	0.02	< 0.01	< 0.010	< 0.01	< 0.01	0.19
B86FH04-04	214	232	0.16	0.74	0.03	0.06	< 0.01	0.01	< 0.010	0.01	< 0.01	0.16
B86FH04-05	214	232	0.36	0.29	0.04	0.06	0.02	0.03	< 0.010	0.01	< 0.01	0.21
B86FH04-06	214	232	0.30	0.41	0.04	0.07	0.02	0.02	< 0.010	0.01	< 0.01	0.19
B86FH04-07	214	232	2.12	4.59	0.58	0.55	0.54	0.25	0.110	0.04	0.12	0.97
B86FH04-01-07DST	214	232	0.41	0.92	0.12	0.17	0.03	0.02	0.010	0.02	0.02	0.34

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH05

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FH05-01	214	232	0.28	0.08	0.03	0.07	< 0.01	< 0.01	< 0.010	0.01	< 0.01	0.26
B86FH05-02	214	232	0.28	0.08	0.04	0.08	< 0.01	< 0.01	< 0.010	< 0.01	< 0.01	0.28
B86FH05-03	214	232	0.31	0.08	0.04	0.08	< 0.01	0.03	< 0.010	0.02	< 0.01	0.20
B86FH05-04	214	232	0.45	0.09	0.05	0.08	< 0.01	0.04	0.010	0.02	< 0.01	0.26
B86FH05-05	214	232	0.46	0.10	0.05	0.11	< 0.01	0.03	0.010	0.02	< 0.01	0.23
B86FH05-06	214	232	0.26	0.08	0.03	0.08	< 0.01	0.01	< 0.010	0.01	< 0.01	0.17
B86FH05-07	214	232	0.49	0.10	0.04	0.07	< 0.01	0.04	0.010	0.01	< 0.01	0.24
B86FH05-08	214	232	1.08	0.15	0.06	0.06	0.02	0.10	0.020	< 0.01	< 0.01	0.37
B86FH05-09	214	232	0.86	0.12	0.05	0.05	< 0.01	0.07	0.020	< 0.01	< 0.01	0.32
B86FH05-10	214	232	1.04	0.14	0.06	0.06	0.01	0.10	0.020	0.01	< 0.01	0.38
B86FH05-11	214	232	1.14	0.20	0.06	0.07	< 0.01	0.11	0.060	0.01	< 0.01	0.36
B86FH05-01-11DST	214	232	0.51	0.14	0.05	0.10	< 0.01	0.04	0.010	0.02	< 0.01	0.30

SITE: FERMONT HIGHWAY DRILL HOLE: B86FHPB

SAMPLE DESCRIPTION	PREP CODE		Al2O3 %	Fe2O3 %	MgO %	CaO %	Na2O %	K2O %	TiO2 %	P2O5 %	MnO %	LOI %
B86FHPB-01	214	232	0.43	0.38	0.07	0.12	0.07	0.02	0.010	0.01	< 0.01	0.18
B86FHPB-02	214	232	0.23	0.11	0.04	0.09	0.02	< 0.01	< 0.010	< 0.01	< 0.01	0.15
B86FHPB-03	214	232	0.54	0.26	0.06	0.11	0.04	0.02	0.010	0.02	< 0.01	0.28

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CERTIFICATE OF ANALYSIS A8622705

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*Page No. :
Tot. Pages:
Date : 18-FEB-87
Invoice # : I-8622705
P.O. # : NONE

Project : DES/QUARTZITE/WABUSH
Comments: ATTN: GOLDER ASSOCIATES CC: JAMIE MEYER

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH04

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FH04-01	214	--	72.10
B86FH04-02	214	--	92.22
B86FH04-03	214	--	98.19
B86FH04-04	214	--	98.87
B86FH04-05	214	--	98.89
B86FH04-06	214	--	99.14
B86FH04-07	214	--	90.43
B86FH04-01-07DST	214	--	98.14

SITE: FERMONT HIGHWAY DRILL HOLE: B86FH05

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FH05-01	214	--	99.41
B86FH05-02	214	--	99.42
B86FH05-03	214	--	99.33
B86FH05-04	214	--	99.04
B86FH05-05	214	--	99.00
B86FH05-06	214	--	99.30
B86FH05-07	214	--	99.08
B86FH05-08	214	--	98.23
B86FH05-09	214	--	98.65
B86FH05-10	214	--	98.35
B86FH05-11	214	--	98.15
B86FH05-01-11DST	214	--	98.86

SITE: FERMONT HIGHWAY DRILL HOLE: B86FHPB

SAMPLE DESCRIPTION	PREP CODE		SiO2 % fusion
B86FHPB -01	214	--	98.99
B86FHPB -02	214	--	99.51
B86FHPB -03	214	--	98.87

APPENDIX D

PHOTOGRAPHS

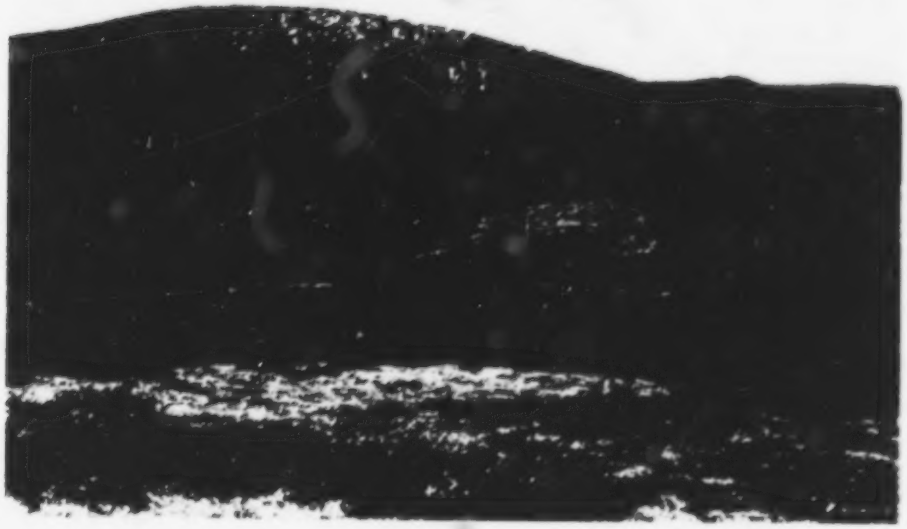

Photo 1: View of 2907 Hill from the South

Photo 2: Quartzite outcrops on 2907 Hill looking North

Photo 3: Longyear 38 on 2907 Hill at Drill Hole A8601 looking South

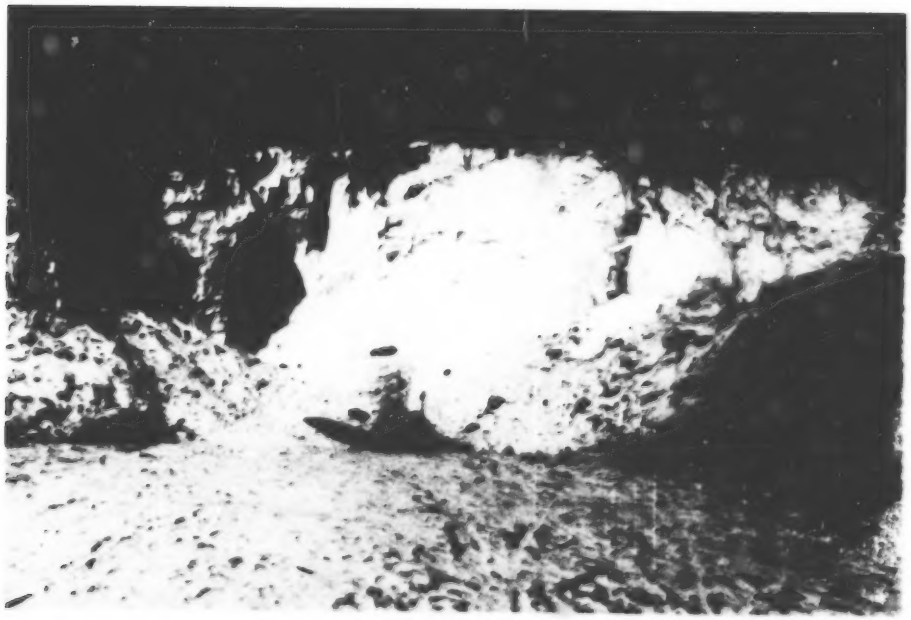

Photo 4: Excavated 5 m high exposure of quartzite at Fermont Highway site

Photo 5: Specially modified air percussion drill on pit floor at Fermont Highway site; Drill Hole B86FHPB

Photo 6: Air percussion drill at Fermont Highway site; Drill Hole B86FH02

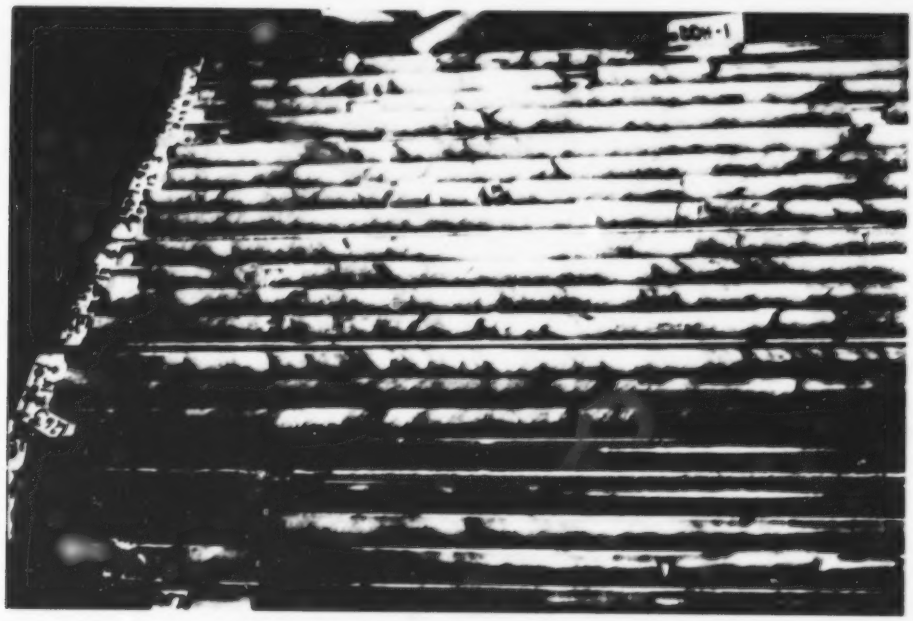

Photo 7: Core from Drill Hole A8601 showing quartzite/amphibolite contact at 80.5 m

Photo 8: Splitting friable quartzite samples from the Fermont Highway site